Upper Fox and Wolf River Basins Volunteer Monitoring Program

Upper Fox and Wolf Basins TMDL

2024 Annual Report

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Project Summary

Project Location

The project area is located within the Upper Fox River and the Wolf River Basins in northeast and central Wisconsin. The Upper Fox Basin is 2,200 square miles and extends from the headwaters of the Fox River in Columbia and Adams Counties to the outlet of Lake Winnebago. The Upper Fox Basin also includes the direct drainage areas to Lake Winnebago. The Wolf River Basin is 3,700 square miles and extends from the headwaters of the Wolf River in Forest County to the Wolf River confluence with Lake Butte des Morts in Winnebago County.

The Upper Fox and Wolf River Basins (UFWB) volunteer monitoring program utilizes citizen volunteers to collect surface water samples from 24 monitoring sites on 23 different streams and rivers throughout the UFWB. There were 20 sites in 2022, four sites were added in 2023 to bring the total to 24 sites sampled in 2024. Sampling locations are evenly distributed among the Upper Fox Basin, Wolf Basin, and Lake Winnebago region. These streams and rivers contribute nutrients and sediment to the Wolf River, Upper Fox River, and Lake Winnebago. Monitoring locations are displayed in Figure 1 and more detailed location information can be found in Appendix A.

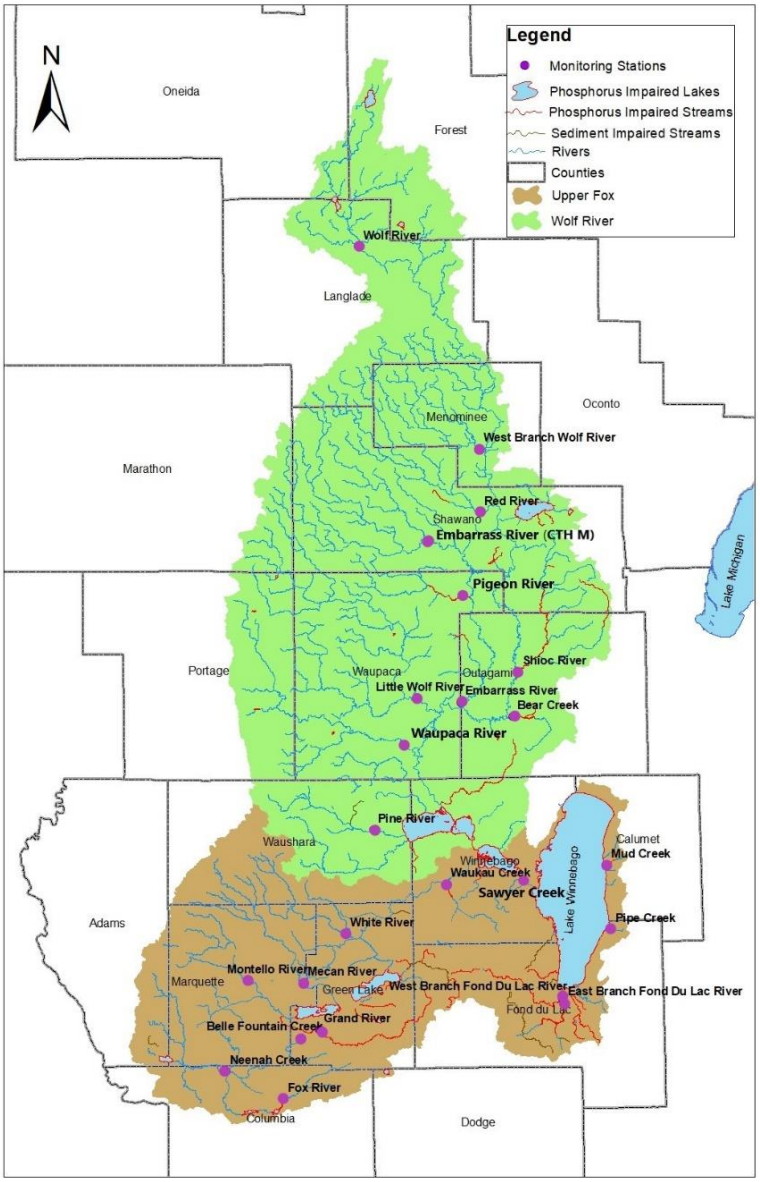


Figure 1: UFWB volunteer monitoring sites.

Project Background

The U.S. Environmental Protection Agency (EPA) approved the UFWB Total Maximum Daily Load (TMDL) in 2020. Implementation of the TMDL aims to improve water quality by reducing total phosphorus (TP) and total suspended solids (TSS) in waterbodies throughout the Basins. The TMDL identifies and quantifies the

sources and necessary phosphorus and sediment reductions to reach water quality goals. To evaluate effectiveness of TMDL implementation activities, one objective of the TMDL is to evaluate long-term water quality trends within the entirety of the UFWB.

The UFWB volunteer monitoring program started in 2020 to achieve some of the monitoring objectives resulting from the TMDL. 24 sampling sites were chosen for monthly (May – October) surface water sampling. Each monitoring location was selected for the program to assess long-term water quality trends throughout the Basins.

Given the time commitment and the spatial extent of the monitoring sites in the UFWB, the assistance of volunteers is vital to the success of the program. Volunteers serve the essential role of data collectors, as they collect monthly surface water samples across the 24 monitoring sites in the UFWB. Volunteers are trained before each sampling season by Wisconsin DNR staff to ensure reliable and accurate results are achieved each month.

Problem Statement

The waters within the UFWB are impaired due to excessive phosphorus and sediment loading. TMDL implementation focuses on restoring waters impaired by excessive sediment and/or high phosphorus concentrations. Phosphorus and sediment cause numerous impairments to waterways, including low dissolved oxygen concentrations, degraded habitat, and excessive turbidity. These impairments adversely impact fish and aquatic life, water quality, recreation, and potentially navigation.

Every two years, Sections 303(d) and 305(b) of the Clean Water Act (CWA) requires states to publish a list of all waters not meeting water quality standards and an overall report on surface water quality status of all waters in the state. Most of the streams and rivers sampled through the UFWB volunteer monitoring program have a target median summer (May – October) TP concentration of 0.075 mg/L, Embarrass River (STH 54) and Little Wolf River have a criteria of 0.1 mg/L. There is a TSS target of 12 mg/L defined by the UFWB TMDL. No water quality criteria currently exist for TN for the streams and rivers sampled through the UFWB volunteer monitoring program.

According to the WDNR 2024 303(d) Impaired Waters list, 12 of the 23 monitoring streams sampled through the UFWB volunteer monitoring program (Bear Creek, East and West Branches of Fond du Lac River, Fox River, Grand River, Mud Creek, Pigeon River, Pipe Creek, Shioc River, Waukau Creek, Waupaca River, and Wolf River) are impaired due to high levels of TP and/or TSS levels in the water. Appendix C provides more information about the impaired monitoring streams.

Project Goals

There are two main goals for this project: (1) Increase public awareness and involvement in water quality issues by engaging residents in citizen science and (2) the collection of reliable surface water quality data to assess long-term water quality trends/success. The volunteer monitoring program aims to increase community awareness on local water quality issues and

the impact of land use decisions around them. The focus is to raise awareness through building a volunteer base and increasing community involvement and engagement.

Through citizen science the volunteer monitoring programs goal is to collect reliable data to characterize TP, dissolved reactive phosphorus (DRP), diatom phosphorus index, TSS, total nitrogen (TN), and associated chemical and physical characteristics in streams during the primary algae and aquatic plant "growing season" of May through October. The monitoring data brings focus to which streams are affected by elevated phosphorus and sediment concentrations.

It is important to note, however, that research is currently underway into the relationship between the reduction of TP, DRP, TN, and biological responses. The collection of TP, DRP, and TN will help strengthen the understanding of these relationships and effects they may have on biological responses in streams.

Additional goals of this project include:

1. Evaluate nutrient and sediment concentrations in the tributaries discharging to the Upper Fox River, Wolf River, and Lake Winnebago.
2. Monitor the health of the basins overtime.
3. Provide a basis for evaluation of the long-term effectiveness of implementation of the Upper Fox and Wolf Basins TMDL; are there water quality improvements in sub-basins with the implementation of best management practices?
4. Share water quality data broadly among stakeholders to collectively assess water quality.

Proposed Work and Sampling Procedure

The UFWB volunteer monitoring program started in 2020 and is proposed to continue as the TMDL progresses and as funds are available. Coordination and implementation of volunteer monitoring efforts are administered by WDNR staff. Specifically, the WDNR:

- Continues to develop a well-trained volunteer base through various means of recruitment and community engagement:
    - Volunteers are trained to follow Water Action Volunteer (WAV) (https://wateractionvolunteers.org/) monitoring protocol to ensure consistency is being met in each sample.
    - Volunteers collect and ship surface water samples in iced coolers to the Wisconsin State Lab of Hygiene (WSLH) for analysis of TP, DRP, TSS, and TN.
    - Volunteers collect streamflow and transparency data at the time of surface water sample collection (if able).
    - Duplicate samples are collected at randomly selected sites throughout the sampling season (Appendix K). Duplicates are collected on the same day and at the same time as the regular sample.
- Continues to provide support to volunteers as needed:
    - Ensures safe access and suitability at each monitoring site.

    - Orders, prepares, and maintains supplies for volunteers to successfully carry out monitoring activities and shipment of samples.
    - Fosters an open line of communication with volunteers to ensure that all stations are being monitored at the frequency outlined in the project QAPP.
- Confirms that all 24 monitoring sites are monitored monthly from May to October for a total of six sampling events per year.
- Compiles monthly sampling data results to share with volunteers and stakeholders:
    - Records data into tables and graphs for analysis.
    - Develops an annual report complete with data and figures to share with stakeholders to assess annual water quality.

2024 Sampling Season

Summary

2024 was the fifth year for the UFWB volunteer monitoring program. The program started in 2020 with 12 monitoring sites and sites have been added over the years. Most recently four sites were added in 2023 for a total of 24 monitoring sites. The sites are spread throughout the UFWB and represent the main rivers and tributaries that eventually lead to Lake Winnebago. The volunteer monitoring program started with nine volunteers, five individuals and two groups. The volunteer base has grown and in 2024 there were 16 returning volunteers and six new ones.

The DNR coordinator trained the new volunteers one-on-one at their sampling site in May, this ensured volunteers were comfortable with their sampling site. This type of training will be used for future seasons because it works with volunteers' schedules, ensures they are sampling at the correct location, and allows for easy equipment drop-off.

Returning volunteers had supplies shipped to their house or the supplies were dropped off by the DNR coordinator. Some sampling supplies such as sample bottles, coolers, Ziploc bags, preservative acid, and DRP supplies were shipped directly to volunteers from the WSLH. In the past, lab slips and shipping labels were created by DNR central office staff, in 2024 the volunteer coordinator took over the role. This ensured consistency with the supplies and made the coordinator the main point of contact for any issues volunteers may run into.

In 2024 there were three missed samples throughout the season from three different monitoring sites: Fox River, West Branch Wolf River, and Wolf River (CTH T). There was lack of communication with the DNR coordinator from these volunteers, next season they will be reminded of the importance of sampling every

Sample Collection Completeness (%) Out of 144 samples per year (6 samples/site)					
Monitoring Site	2020	2021	2022	2023	2024
Bear Creek	33%	83%	100%	100%	100%
Belle Fountain Creek	-	100%	67%	100%	100%
East Branch FDL River	50%	100%	100%	100%	100%
Embarrass River (STH 54)	33%	100%	100%	100%	100%
Fox River	-	100%	50%	100%	83%
Grand River	50%	100%	100%	100%	100%
Little Wolf River	33%	100%	100%	100%	100%
Mecan River	-	100%	67%	100%	100%
Montello River	-	100%	67%	100%	100%
Mud Creek	-	83%	100%	100%	100%
Neenah Creek	-	100%	50%	100%	100%
Pine River	-	83%	100%	100%	100%
Pipe Creek	-	83%	100%	100%	100%
Red River	50%	83%	100%	100%	100%
Shioc River	33%	83%	83%	100%	100%
Waukau Creek	50%	83%	100%	100%	100%
West Branch FDL River	50%	100%	100%	100%	100%
West Branch Wolf River	33%	83%	100%	100%	83%
White River	50%	100%	100%	100%	100%
Wolf River (CTH T)	50%	100%	100%	100%	83%
Embarrass River (CTH M)	-	-	-	100%	100%
Pigeon River	-	-	-	100%	100%
Sawyer Creek	-	-	-	100%	100%
Waupaca River	-	-	-	100%	100%
Combined Percentage	23%	93%	89%	100%	97%

Table 1: UFWB sample collection completeness by monitoring site.

month. Table 1 displays the sample collection completeness percentage for each sampling site since 2020.

In 2024 the shipping courier changed to UPS. US Postal Service (USPS) Priority Mail was the courier from 2021-2023, but shipment reliability decreased in 2023, many samples arrived at the lab late and some shipments were lost for multiple weeks. While UPS was the main courier in 2024, one volunteer will continue to use USPS due to the convenient drop off location and lack of a UPS location in their area. There were no issues with UPS, and it will continue to be the courier for the foreseeable future. All shipping labels were printed and provided to volunteers at the start of the season.

Volunteers are instructed to ship water samples immediately after collection or as early as possible the next day due to the 48-hour hold time for the DRP sample. A total of 43 DRP samples, or 30%, were flagged in 2024 due to the samples exceeding the 48-hour hold time for DRP. This amount is still high but is an improvement from 2023 where 58 samples (40%) were flagged. The shipping courier changed from USPS to UPS, this is a large reason there were less samples flagged. There were no lost packages, and most of the samples showed up to the lab the day after collection. The UFWB is a large region and some of the monitoring sites are hours away from the WSLH, variable shipping times is another factor affecting DRP samples being analyzed on time. Many of the samples arrived at the lab the day after collection, but some of these samples were still flagged because they were analyzed by the lab later than 48 hours after collection. The lab receives a high volume of samples during the summer months due to the increase in water sampling across the state, and these months had the highest number of samples flagged. The coordinator will bring this issue up to lab staff to hopefully prevent this in future seasons. Although these samples were flagged by the lab for exceeding the hold time, they were still able to be processed and the results can be used. Getting samples to the lab and analyzed within 48 hours continues to be an area for improvement as shipping times can vary by carrier and shipping origin.

Given the spatial extent of the UFWB monitoring sites, finding volunteers in some areas of the basin is more challenging. Volunteer recruitment is one aspect of the program that consistently needs to be carried out. The DNR coordinator should continue to recruit volunteers despite having a volunteer at every stream. It would be better to have multiple volunteers at each sampling location to learn and help each other collect the samples. The more volunteers that are recruited, the more the message gets out in the community, which is a main goal of the Program.

Outreach

- The UFWB Volunteer Monitoring Fact Sheet (Appendix B) was shared broadly to DNR staff and county land and water programs to help recruit volunteers.
- A DNR press release was published on March 4th, 2024 to promote the program and recruit volunteers for future seasons (Appendix M).
- County Land and Conservation departments were contacted to assist with sample collection in 2023, multiple counties sample for this volunteer monitoring program.

Water Quality Data

Wisconsin Listing Methodology

To evaluate stream water quality and TP reductions, the WDNR follows a standard assessment procedure which accounts for sample methods, timing, variability, sample size and statistical confidence to more confidently determine whether a stream meets water quality standards. The volunteer monitoring programs TP sampling data is compared to Wisconsin's TP water quality criteria (WQC) for streams (0.075 mg/L) and rivers (0.1 mg/L) by calculating the Growing Season Median (GSM) and the upper and lower 90% confidence limits of the GSM for each monitoring location. A stream is listed as impaired for TP if the lower 90% confidence limit of the GSM (May – October) TP concentration exceeds the stream WQC. The lower 90% confidence limit is used to ensure a stream exceeds the criteria with a predetermined level of confidence, before it is listed. A stream that is impaired for TP will be de-listed if the upper 90% confidence limit of the GSM TP subsequently drops below, or clearly attains, the criteria.[1] See Figure 2.

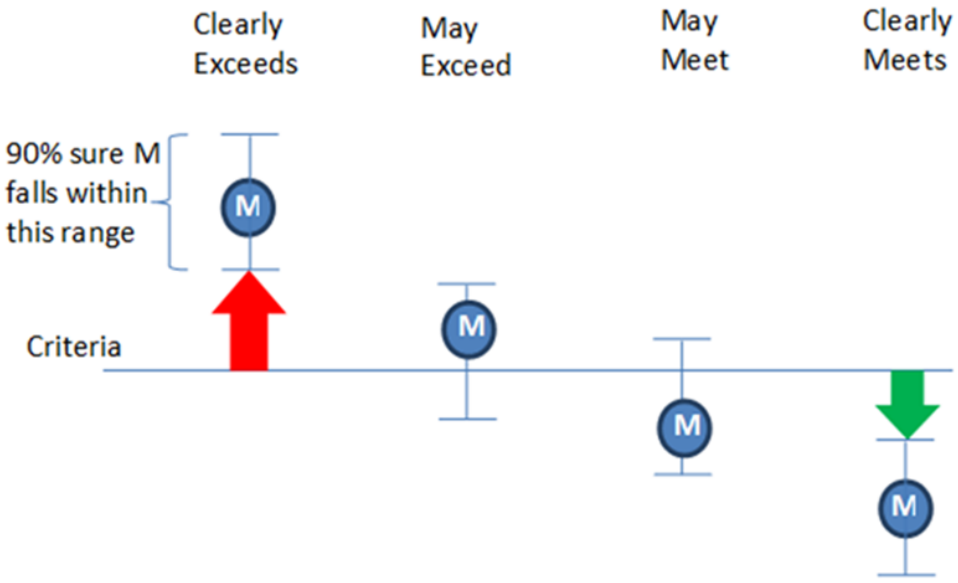


Figure 2: Wisconsin TP criteria confidence limit table. Criteria line represents the 0.075 mg/L WQC limit and M represents the GSM value.

A GSM and 90% Confidence limits were calculated for each monitoring site each year of data collection. A minimum of six samples, one per month from May – October, are needed to calculate the confidence limits. In years with less than six data points at a location, a data point from the same month from the most recent year of a full dataset should be used instead. There were three missed samples in 2024, Fox River (October), West Branch Wolf River (June), and Wolf River- CTH T (August). Data from the corresponding month in 2023 will be used in place of the missing data. The confidence limits calculated in this data summary will not be used for

[1] WDNR 2020. Guidelines for Monitoring for Watershed Restoration Effectiveness. Wisconsin Department of Natural Resources, Bureau of Water Quality. Madison, Wisconsin. EGAD#3200-2020-26

stream listing purposes, however the data can be used for future listing assessments. A confidence interval table is provided in Appendix D.

Based on the confidence limits calculated in 2024, the relation to criteria for 10 of the monitoring streams is "Clearly Meets" (Embarrass River (CTH M), Grand River, Mecan River, Montello River, Pine River, Red River, Waupaca River, West Branch Wolf River, White River, and Wolf River (CTH T)). There are two streams that "May Meet", seven streams that "May Exceed", and the remaining five streams "Clearly Exceeds".

20 of the sites have four years of data to calculate confidence limits, confidence limits were not calculated in 2020 due to the limited data set. Confidence limit graphs for these sites can be found in Appendix E, the four sites added in 2023 are not included because there are only two years of data (Embarrass River (CTH M), Pigeon River, Sawyer Creek, and Waupaca River). The confidence limits and GSM TP values of 11 of the 20 monitoring sites show an overall decline since 2021. These sites include Belle Fountain Creek, East Branch FDL River, Fox River, Grand River, Mecan River, Montello River, Mud Creek, Pine River, Shioc River, Waukau River, and West Branch Wolf River. It will be important to monitor confidence limits in future seasons, these will help assess water quality trends over time and track progress as implementation occurs.

Total Phosphorus Analysis

TP median values are calculated every year of sampling, even if there is less than 100% sample collection. The median is calculated instead of the mean in accordance with Wisconsin Consolidated Assessment and Listing Methodology (WisCALM) protocol for streams and rivers. Median is used for datasets with high variability to ensure results are not skewed by one extremely high or low value; streams and rivers tend to have higher variability in concentrations compared to lakes where the mean is used. Table 2 displays

TP Median (mg/L)					
Monitoring Site	2020	2021	2022	2023	2024
Bear Creek	0.072	0.145	0.168	0.171	0.191
Belle Fountain Creek	-	0.094	0.060	0.065	0.078
East Branch FDL River	0.203	0.299	0.289	0.160	0.206
Embarrass River (STH 54)	0.047	0.090	0.089	0.056	0.092
Fox River	-	0.098	0.089	0.075	0.125
Grand River	0.178	0.161	0.064	0.225	0.024
Little Wolf River	0.043	0.049	0.051	0.037	0.087
Mecan River	-	0.060	0.047	0.040	0.029
Montello River	-	0.100	0.090	0.044	0.043
Mud Creek	-	0.626	0.782	0.600	0.240
Neenah Creek	-	0.130	0.089	0.094	0.119
Pine River	-	0.050	0.042	0.037	0.039
Pipe Creek	-	0.222	0.087	0.299	0.276
Red River	0.024	0.022	0.018	0.021	0.025
Shioc River	0.320	0.243	0.812	0.344	0.216
Waukau Creek	0.143	0.092	0.131	0.103	0.079
West Branch FDL River	0.177	0.337	0.291	0.409	0.321
West Branch Wolf River	0.018	0.039	0.019	0.016	0.016
White River	0.024	0.036	0.031	0.031	0.029
Wolf River (CTH T)	0.036	0.034	0.027	0.035	0.032
Embarrass River (CTH M)	-	-	-	0.034	0.047
Pigeon River	-	-	-	0.067	0.078
Sawyer Creek	-	-	-	0.103	0.120
Waupaca River	-	-	-	0.027	0.039

Table 2: Annual Median TP values by monitoring site, red values indicate years with missing data.

the median TP values for each sampling location monitored from 2020-2024. Red values indicate there was less than 100% sample collection at the monitoring site for that year. These median values were calculated from only the samples collected at the monitoring site for that year, compared to the GSM which uses previous years values if there is missing data.

In 2024, 12 of the 24 monitoring sites had median TP values exceeding Wisconsin's TP WQC, this is higher than 2023 where 10 of the monitoring sites exceeded the WQC. A graph of the median values for each monitoring site can be found in Appendix F. Sampling data for all parameters is found in Appendix J.

Total phosphorus is a key indicator of water quality. It is an essential nutrient for plant growth however, when excess amounts are introduced to a waterbody, water quality can decrease and lead to harmful algal blooms. The established State TP WQC for the UFWB streams is 0.075 mg/L, Embarrass River (STH 54) and Little Wolf River have a criteria of 0.1 mg/L. To evaluate stream TP concentrations, each TP sample was compared to the 0.075 mg/L TP criteria, samples from Embarrass River (STH 54) and Little Wolf River were compared to 0.1 mg/L. Table 3 compares the UFWB TP samples to the State TP WQC (excluding Embarrass River (STH 54) and Little Wolf River). In 2024, 70 of 129 (54%) TP samples met the TP criteria of 0.075 mg/L, this is a 1% decrease from 2023. The percentage of TP samples meeting the TP WQC has stayed consistent since the start of the program in 2020, in 2020 48% of samples met the WQC and in 2024 it is 6% more. The number of TP samples from the Embarrass River (STH 54) and Little Wolf River meeting the TP WQC of 0.1 mg/L has been high throughout the program. 2024 was the year with the lowest percentage of samples below 0.1 mg/L at 50% (Table 4).

TP Samples Below 0.075 mg/L	2020	2021	2022	2023	2024
# Sites	10	18	18	22	22
# Samples Collected	27	100	95	132	129
# Above 0.075 mg/L	14	60	48	60	59
# Below 0.075 mg/L	13	40	47	72	70
% Below 0.075 mg/L	**48%**	**40%**	**49%**	**55%**	**54%**

Table 3: TP samples compared to the TP WQC for 22 of the monitoring sites, Embarrass River (STH 54) and Little Wolf River not included.

TP Samples Below 0.1 mg/L	2020	2021	2022	2023	2024
# Samples Collected	4	12	12	12	12
# Above 0.1 mg/L	0	2	1	0	6
# Below 0.1 mg/L	4	10	11	12	6
% Below 0.1 mg/L	**100%**	**83%**	**92%**	**100%**	**50%**

Table 4: TP samples compared to TP WQC of 0.1 mg/L for Embarrass River (STH 54) and Little Wolf River.

Dissolved Reactive Phosphorus Analysis

While total phosphorus is a key indicator of water quality, DRP also plays an important role in water quality. DRP is the soluble form of phosphorus and is readily available for plant and algae growth. Excessive amounts of DRP can also lead to excessive algae growth and potentially harmful algal blooms, this can cause poor water quality.

A TP sample and a DRP sample are collected during each sampling event. These samples are compared to determine the percentage of dissolved phosphorus present in the TP sample. Appendix G breaks out the TP/DRP percentages for each sample event. The red values in the table indicate the DRP concentration exceeded the TP concentration, this is due to sample variance. The bold and italicized values indicate that the DRP sample exceeded the TP WQC of 0.075 mg/L. In 2024 11 of the 24 monitoring sites had at least one DRP sample that exceeded the TP WQC. In addition to high DRP values at these monitoring sites, the percentage of DRP also consistently remains high at these sites.

Table 5 further breaks down the DRP percentages into percentage ranges. 52 of 140, or 37%, of TP samples collected in 2024 had 40-60% of their TP concentrations from DRP which is the most among all percentage ranges in 2024. 2024 was the first sampling season with more samples in the 40-60% range, in previous seasons most of the samples were in the 20-40% range. There was more rain in 2024, which could be the reason for the increase in DRP concentrations due to an increase in runoff, this is why it's important to sample consistently for many years to account for variability. It will be important to monitor these percentages over time as implementation in the UFWB continues as it may teach us which types of implementation help reduce DRP concentrations in rivers and streams.

DRP Percentage of TP Ranges								
Year	# Sites	# Samples Collected	< 20% DRP	20 - 40% DRP	40 - 60% DRP	60 - 80% DRP	80 - 100% DRP	> 100% DRP
2020	12	31	0	0	7	8	11	5
2021	20	112	15	31	17	29	20	0
2022	20	106	14	37	20	21	15	0
2023	24	144	31	41	29	30	13	0
2024	24	140	5	40	52	34	9	0
Total		533	65	149	125	122	68	5
Percent of Total			**12%**	**28%**	**23%**	**23%**	**13%**	**1%**

Table 5: DRP Percentage of TP Ranges (DRP >100% due to sample variance).

Total Suspended Solids Analysis

TSS results vary by site with no clear trend of concentrations increasing or decreasing from 2020-2024. The TSS median concentrations were higher in 2024 than 2023 for 14 of the monitoring sites, including the four sites added in 2023 that only have two years of data. The 2024 sampling season had more precipitation than average, which results in more runoff, yet TSS concentrations at some monitoring sites were lower than previous seasons. TSS medians for all sites from 2020-2024 are shown in Appendix H.

The UFWB TMDL defines a numeric TSS target of 12 mg/L for streams and rivers in the basin. In 2024 four of the monitoring sites had a median over this target, Embarrass River (STH 54), Little

Wolf River, Montello River, and Pipe Creek. Since the start of the program 10 of the sites have had medians under this target every year.

Median TSS and TP results by month are compared in Figure 3, all TSS and TP data from 2020-2024 was used. TSS and TP have a similar trend throughout the season, June and July are peak months and concentrations decrease August-October. TSS concentrations are higher than TP in May.

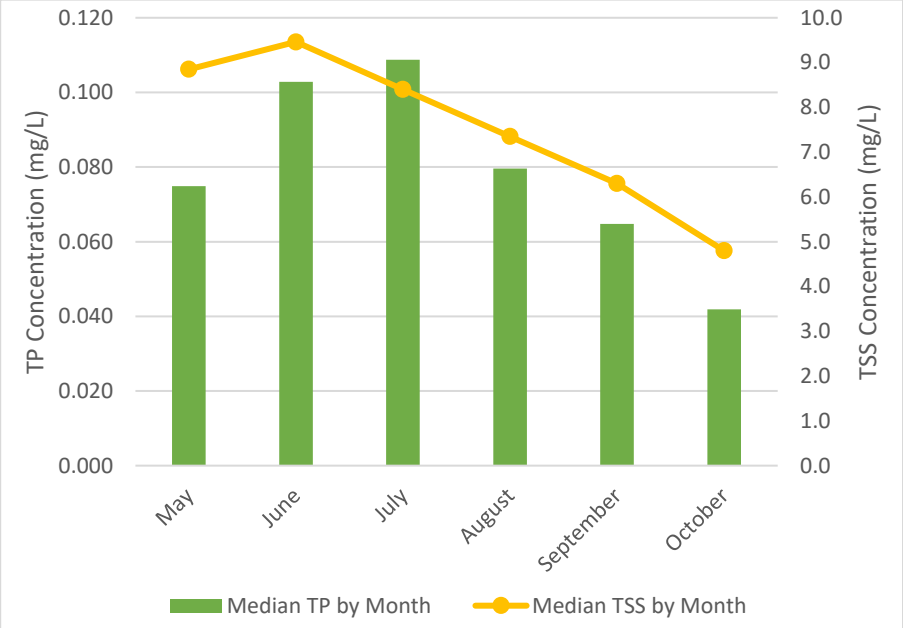


Figure 3: Median TSS and TP concentration by month.

Total Nitrogen Analysis

Total nitrogen analysis may provide valuable insight to water quality as Nitrogen may have similar impacts to water quality as phosphorus. Nitrogen is commonly found and used in agricultural settings, testing for it may prove useful in assessing water quality across the UFWB. TN concentrations vary by site, there is no clear trend across the sampling seasons. For 20 of the monitoring sites TN median concentrations were higher in 2024 than 2023, and the TN median concentration peaked for nine of the sites in 2024 (East Branch FDL River, Embarrass River (CTH M), Mecan River, Montello River, Pigeon River, Pine River, Sawyer Creek, West Branch FDL River, and Wolf River (CTH T)). There was more than average precipitation in 2024, this may be one of the reasons TN concentrations were higher. It's important to monitor water quality for many years to account for weather variability. TN medians from 2020-2024 are shown in Appendix I.

Field Quality Assurance/Quality Control Duplicate Samples

To document the accuracy and precision of the field data collected by volunteers, duplicate samples were taken as quality assurance/quality control (QA/QC) samples. In previous years 10% of the samples taken also had a duplicate sample, there were fewer duplicate samples in 2023 and 2024 due to budget constraints. Two duplicate samples were scheduled, but one was missed, the coordinator will make sure to be clearer to volunteers who are scheduled to take a duplicate sample so they are not missed in the future. The duplicate sample locations were randomly selected from the list of sites that are monitored. These QA/QC tests document the accuracy and precision of the data collected and look at natural variability and sampling error.

Duplicate samples are collected on the same day and time as the regular samples, they are analyzed for the same parameters as the regular samples. Duplicate sample results were compared to the regular sample result and an absolute difference was calculated. The absolute difference between the two sets of samples is compared to each test's Level of Quantification (LOQ) and is considered good data quality if the value falls below the LOQ. The absolute difference for all parameters for the 2024 duplicate sample was below the LOQ, meaning it is good quality data. Relative percent difference between the regular and duplicate samples was also calculated, the results are flagged if the percentage is greater than 30% as this indicates a variance between the two sample results. The relative percent difference for each parameter was below 30%, indicating limited variance. Duplicate sample results are in Appendix K.

Stream Flow and Transparency

In addition to collecting surface water samples each month, volunteers collect stream flow and water transparency data. Stream flow is affected by the amount of water within a watershed and increases with rainstorms or snowmelt and decreases during dry periods. Flow defines the shape, size, and course of the stream. Streamflow and transparency data can be found in Appendix L.

Volunteers measure streamflow using a velocity-area approach. A 20 ft. length of stream is assessed, the volunteer measures the width of the stream and the water depth at numerous locations across the width. Water velocity is determined by measuring the time it takes for a tennis ball to float along the stream length. To measure streamflow, the stream needs to be wadable and two people are required. Most of the monitoring sites do not meet these requirements and it would be unsafe to measure streamflow.

Water transparency is collected each month with a transparency tube. Water clarity is closely tied to suspended sediment in the water and is also affected by dissolved material and algae. Transparency readings range from 0-120cm, clear water with minimal dissolved material has a reading of 120cm. In 2024, 29 of the 105 (28%) transparency readings were 120cm, which is 14% less than 2023. There was more rain in 2024, which increases the amount of runoff potentially making transparency results lower. Transparency readings will continue to be analyzed in future seasons to determine if water clarity is increasing across the UFWB.

Key Takeaways for 2020-2024

- The number of TP samples below the State WQC of 0.075 mg/L decreased in 2024, with 54% of the samples below 0.075 mg/L in 2024 compared to 55% in 2023.
    - This does not include samples from Embarrass River (STH 54) and Little Wolf River because the TP WQC for these rivers is 0.1 mg/L. 50% of the TP samples from these sites were below 0.1 mg/L in 2024 compared to 100% of the samples in 2023.
- 10 of the 24 monitoring sites sampled in the UFWB "Clearly Meet" TP WQC and two "May Meet" according to their confidence limits calculated with data from 2024.
    - Confidence limits for 12 of the 24 monitoring sites exceeded the State WQC in 2024, five of the streams "Clearly Exceed" and the seven "May Exceed".
- DRP concentrations increased in 2024, the highest percentage of samples had 40-60% of their TP concentrations from DRP. This is the first season where the percentage range with the greatest number of samples was not 20-40%.
    - Increased precipitation in 2024 could have contributed to higher DRP concentrations.
    - Precipitation in 2024 varied across the UFWB, with much of the basin receiving two to six inches more precipitation than average.
- In 2024, four of the monitoring sites had a median TSS concentration over the TSS target of 12 mg/L.
- TSS and TP median concentrations by month have a similar trend, with high concentrations in June and July and from August to October median concentrations decrease.
- TN median concentrations were higher in 2024 than 2023 for 20 of the monitoring sites, this could be due to the above average precipitation across the basin.

Conclusions

Data Conclusions

The UFWB volunteer monitoring program has been going for five years, there is not enough data to see a definitive trend in the sampling streams. The program is still young, and trends will change throughout its existence, especially when best management practices and implementation continue in the UFWB and improve the water quality in the given watersheds. Raw data may suggest that variations in weather patterns, temperature, and time of year may have an impact on the TP, DRP, TSS, and TN concentrations. Weather varies each sampling season which is why it's important to sample consecutive years; 2024 had higher than average rainfall, which can affect the median values for 2024.

In 2024 there were 10 monitoring sites with a median TP value below the WQC of 0.075 mg/L, this number does not include Embarrass River (STH 54) and Little Wolf River which had a median below their WQC of 0.1 mg/L. Appendix F contains a graph showing the median TP values for each monitoring site. There was a decrease of TP samples meeting the TP WQC of 0.075 mg/L in 2024, in 2023 55% of TP samples met the WQC and in 2024 it was 54%. This percentage has stayed consistent since the program began in 2020. As of now the data does not show water quality improvement, it is important to continue monitoring for improvements and trends.

Dissolved phosphorus percentages were decreasing for three sampling seasons, but in 2024 they increased. Appendix G provides a table of the percentage of DRP making up each TP sample and Table 4 categorizes the values into percentage categories. In 2024 the DRP percentage range with the most samples was 40-60%, this is different from previous seasons where most of the samples have consistently been in the 20-40% range. The dissolved form of phosphorus is readily available for plant uptake and contributes to harmful algal blooms, it is important best management practices focus on reducing DRP along with total phosphorus.

Total suspended solids results continue to vary by site. There is a TSS target of 12 mg/L defined by the UFWB TMDL, only four of the monitoring sites had a median above this target in 2024. For 14 of the monitoring sites, the TSS median was higher in 2024 than 2023, this could be due to the increased precipitation compared to last season. Median TSS and TP results by month show a similar trend across the sampling season, median concentrations for these parameters peak in June and July and decreases from August to October.

There is no criteria or goal for total nitrogen. TN median concentrations for 20 of the monitoring sites was higher in 2024 than 2023, and the TN median concentration peaked for nine of the sites in 2024. There is no clear trend for TN, median concentrations for many of the sites have stayed consistent since the start of the program, while few show a clear increase or decrease.

The data collected through the UFWB volunteer monitoring program shows there are water quality improvements that still need to be made, establishing best management practices in these basins is important and monitoring should continue.

Program Conclusions

The primary goal of the UFWB volunteer monitoring program is to engage the public and increase their awareness of water quality issues. In 2024, 22 volunteers, including six new ones, collected samples across 24 monitoring sites. Some of these volunteers are part of larger organizations, making the contribution much higher. With the knowledge our past and present volunteers possess, they can teach others and be an extension of the program. Our volunteers can talk about their experiences and the things they have seen with others, which allows the information to be carried out to even more individuals in the area.

Volunteer recruitment has been carried out through various ways throughout the project. Two main means for volunteer recruitment were expanding outreach through Fox Wolf Watershed Alliance and outreach to County Land and Water Conservation Departments. These partnerships allowed the DNR to recruit volunteers on a bigger platform and spread awareness about the volunteer monitoring program. In 2024 a DNR press release was published to spread awareness of the program and recruit volunteers, this was successful as multiple volunteers were recruited through the press release.

The use of volunteers has proved important for success. Many volunteers are involved with the program which requires constant coordination and communication by the DNR coordinator to ensure success of the program. Communication proves to be the most important aspect of the DNR coordinator's position. The coordinator is the liaison between the volunteers and other DNR staff that are involved within the program. Without proper communication, some aspects of the program can potentially be impacted.

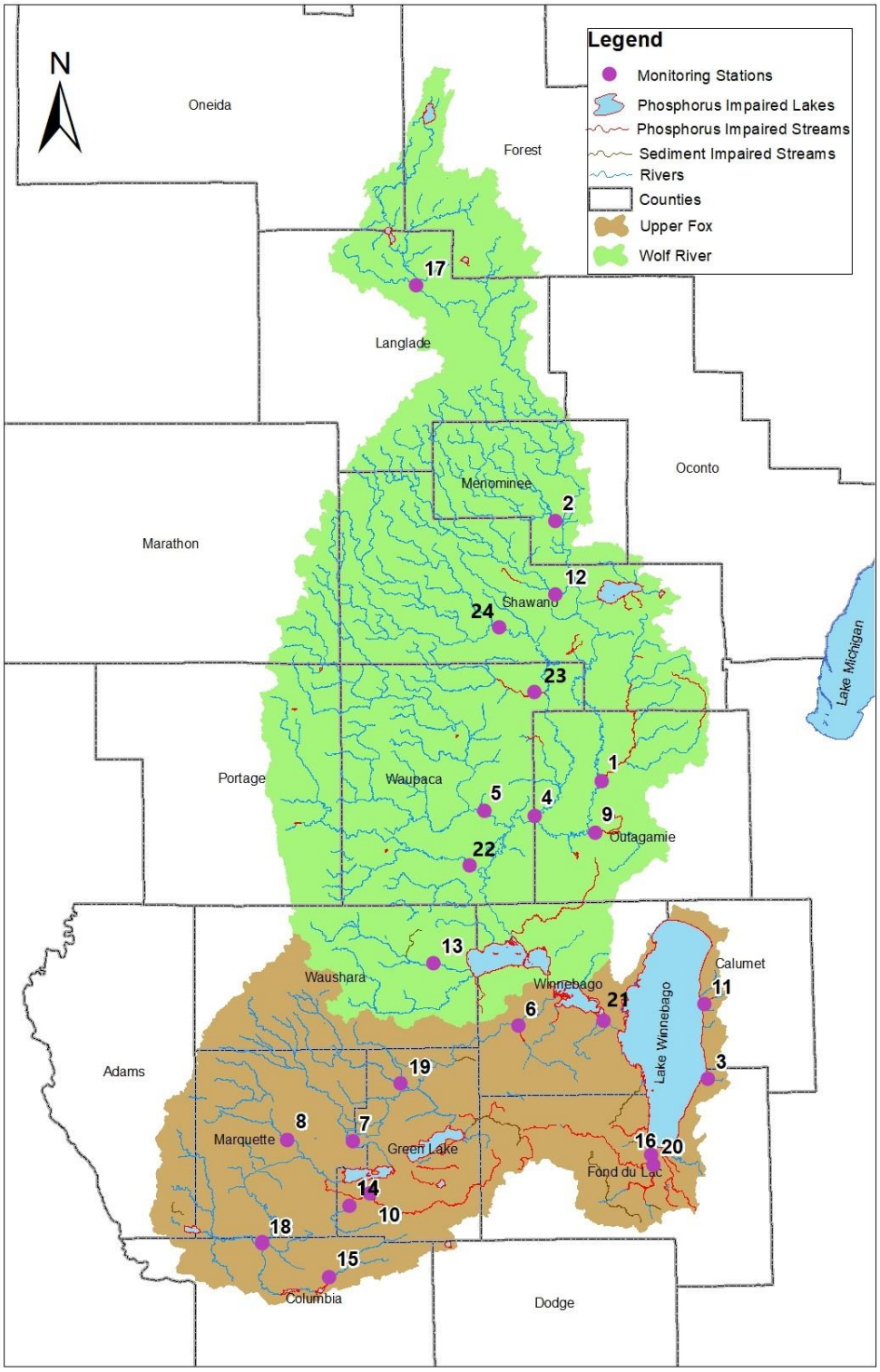
The water quality data is crucial to assessing long-term trends in water quality. The water quality data can be used to determine where additional monitoring should occur when additional resources become available and target other monitoring efforts in particular watersheds. Five watersheds within the UFWB currently have 9 Key Element plans to reduce phosphorus and sediment in high loading watersheds: Bear Lake-Little Wolf River (2017), Big Green Lake (2022), Pipe Creek (2018), Shaw Creek-Little Wolf River (2019), and Weyauwega Lake-Waupaca River (2019). As implementation of these plans occur, monitoring data will be used to help track implementation progress and determine where additional data and information is needed to track progress.

Acknowledgements

Thank you to all the volunteers, present and past, that have made the Upper Fox and Wolf River Basins Volunteer Monitoring Program possible. Thank you to the Wisconsin DNR and the WAV program for funding and support. The WAV program manages a nutrient data database, where results can be viewed for monitoring sites across the state (WAV Data Dashboard (wisc.edu)).

Appendices

Appendix A: Upper Fox and Wolf River Basins Volunteer Monitoring Sites and TMDL Basin Boundaries



	Stream Name	SWIMS Station Name	County	SWIMS ID	Latitude	Longitude
1	Shioc River	Shioc River at STH 187	Outagamie	453030	44.464379	-88.56017
2	West Branch Wolf River	West Branch Wolf River at West Branch Rd	Menominee	403003	44.94093	-88.66435
3	Pipe Creek	Pipe Creek- 30 feet above HWY 151 Bridge	Fond du Lac	10016803	43.91841	-88.3103
4	Embarrass River	Embarrass River at New London HWY 54	Outagamie	10033493	44.405953	-88.73024
5	Little Wolf River	Little Wolf River at Royalton STH 54	Waupaca	693217	44.418276	-88.85648
6	Waukau Creek	Waukau Creek at CTH E USGS Site ID 04073970	Winnebago	713285	44.01841	-88.7854
7	Mecan River	Mecan River at CTH C	Marquette	393005	43.816794	-89.20955
8	Montello River	Montello River at 11th St Bridge USGS Site ID 04072845	Marquette	1022879	43.82047	-89.3575
9	Bear Creek	Bear Creek at STH 76	Outagamie	453259	44.365693	-88.57791
10	Grand River	Grand River at CTH H Near Kingston, WI	Green Lake	243015	43.711983	-89.1541
11	Mud Creek	Mud Creek at Mud Creek Rd	Calumet	83121	44.05352	-88.3171
12	Red River	Red River at Maple Ave	Shawano	10014632	44.803515	-88.65981
13	Pine River	Pine River at HWY 49	Waushara	10032735	44.13583	-88.9962
14	Belle Fountain Creek	Belle Fountain Creek at CTH B	Green Lake	243028	43.704172	-89.21482
15	Fox River	Fox River at HWY 33	Columbia	10014339	43.569939	-89.27703
16	West Branch Fond du Lac River	West Branch FDL at Forest Ave	Fond du Lac	10037662	43.77697	-88.4553
17	Wolf River	Wolf River at CTH T	Langlade	343057	45.367529	-89.01287
18	Neenah Creek	Neenah Creek at CTH CM	Columbia	113070	43.631283	-89.43518
19	White River	White River at White River Rd Landing	Green Lake	10041320	43.917482	-89.07898
20	East Branch Fond du Lac River	East Branch FDL at 12th St	Fond du Lac	10014745	43.76557	-88.4511
21	Sawyer Creek	Sawyer Creek at N Westfield Street	Winnebago	10034847	44.02862	-88.57722
22	Waupaca River	Waupaca River at River Road Weyauwega	Waupaca	693020	44.31608	-88.90498
23	Pigeon River	Pigeon River at Klemp Rd	Waupaca	693135	44.62791	-88.73169
24	Embarrass River	Embarrass River at CTH M	Shawano	593168	44.74056	-88.80111

Appendix B: Upper Fox and Wolf River Basins Volunteer Monitoring Fact Sheet

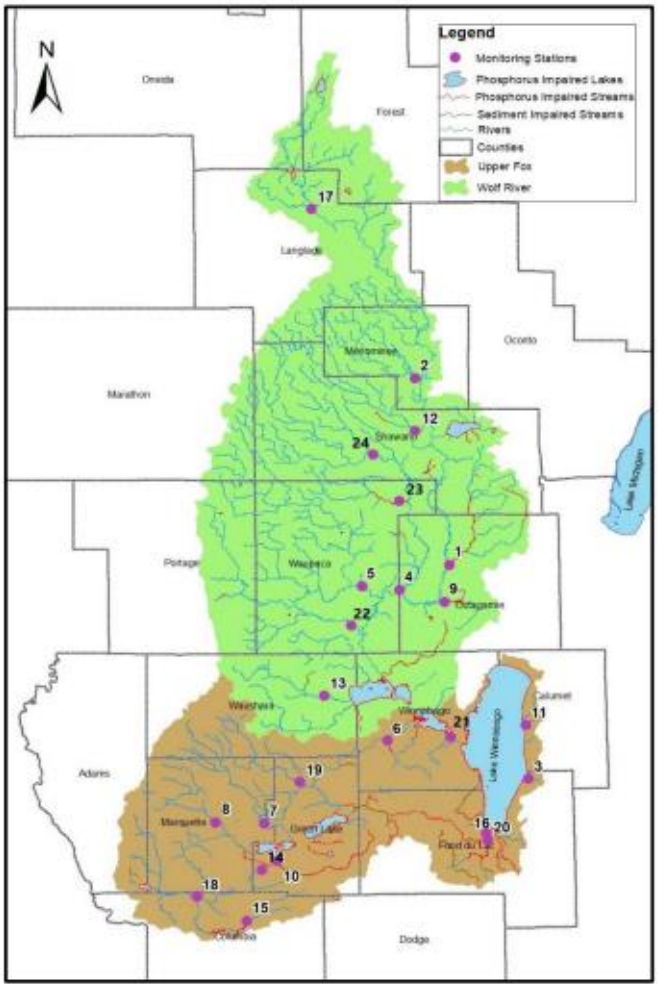
Upper Fox and Wolf River Basins Volunteer Monitoring Fact Sheet

The U.S Environmental Protection Agency (EPA) approved the Upper Fox and Wolf River Basins (UFW) Total Maximum Daily Load (TMDL) in 2020. The TMDL identifies the need for reductions in Total Phosphorus (TP) and Total Suspended Solids (TSS) in waterbodies throughout the basin to meet water quality standards. A total of 43 streams and rivers and 19 lakes and reservoirs are impaired for excess phosphorus, while a total of 19 streams and rivers are impaired for excess sediment. Phosphorus is an essential nutrient for plant growth, but can have detrimental effects on lakes, rivers, and streams when excess amounts are introduced. Common forms of pollutant delivery in these systems include surface runoff from urban and agricultural areas and discharges from wastewater treatment facilities, industrial businesses, and farms.

To assess long-term trends in water quality, 24 stream sites were chosen as part of the UFW Volunteer Monitoring Program to collect surface water samples throughout the UFW basin. There were 20 sites when the program started in 2020, and four were added in 2023 to bring the total to 24 sites across. The UFW Volunteer Monitoring Program relies on volunteers to collect reliable data to assist the DNR in tracking water quality trends overtime. Volunteers collect water samples once per month, May through October. Samples are shipped to the State Lab of Hygiene in Madison and are analyzed for Total Phosphorus, Dissolved Reactive Phosphorus, Total Suspended Solids, and Total Nitrogen.

UFW Basin Facts:

- Watershed area: 5,900 square miles
- Covers 18 counties
- Includes 5 tribal lands
- 32 Concentrated Animal Feeding Operations (CAFOs)
- 29 permitted Municipal Separate Storm Sewer System (MS4s*)
- 78 dischargers (municipal and industrial)



Want to get involved or have questions? Contact:

Katherine Rynish
Water Resource Management Specialist
Natural Resource Program Coordinator
Phone: (920) 296-5126
Email: Katherine.Rynish@wisconsin.gov

See backside for exact sample locations.

*MS4s - municipal separate storm sewer system; municipalities with WPDES permits for stormwater management.

	Stream Name	SWIMS ID	SWIMS Station Name	County	Latitude	Longitude
1	Shioc River	453030	Shioc River at STH 187	Outagamie	44.46438	-88.56017
2	West Branch Wolf River	403003	West Branch Wolf River at West Branch Rd	Menominee	44.94093	-88.66435
3	Pipe Creek	10016803	Pipe Creek- 30 ft above STH 151 Bridge	Fond du Lac	43.91841	-88.3103
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9	Bear Creek	453259	Bear Creek at STH 76	Outagamie	44.36569	-88.57791
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14	Belle Fountain Creek	243028	Belle Fountain Creek at CTH B	Green Lake	43.70417	-89.21482
15	Fox River	10014339	Fox River at STH 33	Columbia	43.56994	-89.27703
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20	East Branch Fond du Lac River	10014745	East Branch FDL at 12th St	Fond du Lac	43.76557	-88.4511
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24	Embarrass River	593168	Embarrass River at CTH M	Shawano	44.74056	-88.80111

*SWIMS – Surface Water Integrated Monitoring System; a Wisconsin DNR information system that holds chemistry (water, sediment), physical, and biological (macroinvertebrate, aquatic invasive species) surface water data.

More information can be found at:
https://dnr.wisconsin.gov/topic/TMDLs/FoxWolf/VolunteerMonitoring.html

Appendix C: Impaired Monitoring Streams

Local Waterbody Name	Waters ID	WBIC	County	Start Mile	End Mile	Total Size	Date Listed	Source Category	Pollutant	Impairment	Listing Condition Category
Bear Creek	9791	316000	Outagamie	0.5	2	1.5	4/1/2012	PS/NPS	Total Phosphorus	High Phosphorus Levels	TMDL approved by EPA in 2020 (4A)
	9792			2	8	6	4/1/2012	NPS	Total Phosphorus	High Phosphorus Levels	
East Branch Fond Du Lac River	10991	135900	Fond Du Lac	0	14.5	14.5	4/1/2014	NPS	Total Phosphorus	Impairment Unknown	TMDL approved by EPA in 2020 (4A)
	3990279			14.5	22.81	8.31	4/1/2018	PS/NPS	Total Phosphorus	High Phosphorus Levels	Phosphorus only (5P)
West Branch Fond Du Lac River	10990	134000	Fond Du Lac	0	26.79	26.79	4/1/2016	PS/NPS	Unknown Pollutant	Elevated Water Temperature	TMDL Needed (5A)
									Total Phosphorus	High Phosphorus Levels	TMDL approved by EPA in 2020 (4A)
Fox River	5535277	117900	Columbia	176	183.2	7.2	4/1/2022	NPS	Total Phosphorus	Impairment Unknown	TMDL approved by EPA in 2020 (4A)
	6778560		Green Lake, Marquette	126.8	134.3	7.4		PS/NPS	Total Phosphorus	Degraded Biological Community	

Grand River	11097	159300	Green Lake, Marquette	0	21	21	4/1/2014	PS/NPS	Total Phosphorus	Degraded Biological Community	TMDL approved by EPA in 2020 (4A)
	10702		Fond Du Lac, Green Lake, Marquette	21	43	22	4/1/2016		Total Phosphorus	Impairment Unknown	TMDL approved by EPA in 2020 (4A)
Mud Creek	10259	131600	Calumet	0	3	3	4/1/2016	NPS	Total Phosphorus	Degraded Biological Community	TMDL approved by EPA in 2020 (4A)
Pigeon River	9711	293100	Waupaca	0	5.2	5.2	4/1/2014	PS/NPS	Total Phosphorus	Impairment Unknown	TMDL approved by EPA in 2020 (4A)
	8107179			7.7	10.7	3			Total Phosphorus	Impairment Unknown	
Pipe Creek	10979	132800	Fond Du Lac	0	2.5	2.5	4/1/2020	NPS	Total Phosphorus	Degraded Biological Community	TMDL approved by EPA in 2020 (4A)
Shioc River	9800	316800	Outagamie, Shawano	0	27.96	27.96	4/1/2012	PS/NPS	Total Phosphorus	Degraded Biological Community, High Phosphorus Levels	TMDL approved by EPA in 2020 (4A)

Waukau Creek	18163	140700	Winnebago	0	4.22	4.22	4/1/2014	NPS	Total Phosphorus	Impairment Unknown	TMDL approved by EPA in 2020 (4A)
Waupaca River	315887	257400	Waupaca	17.3	46	28.7	4/1/2016	PS/NPS	Unknown Pollutant	Elevated Water Temperature	TMDL needed (5a)
Wolf River-Main Stem	11237	241300	Winnebago	0	9.5	9.5	4/1/1998	NPS	Total Phosphorus	Low DO	TMDL approved by EPA in 2020 (4A)
									Sediment/ Total Suspended Solids	Degraded Habitat	

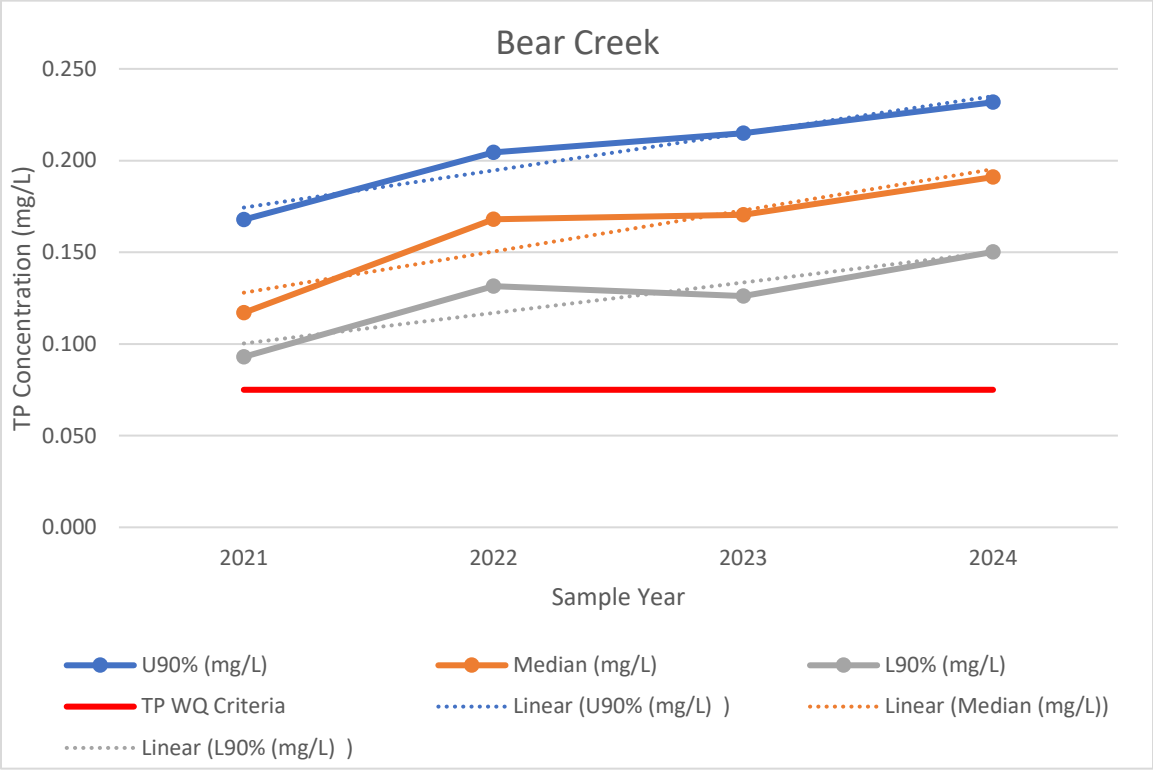
Appendix D: Confidence Interval Table

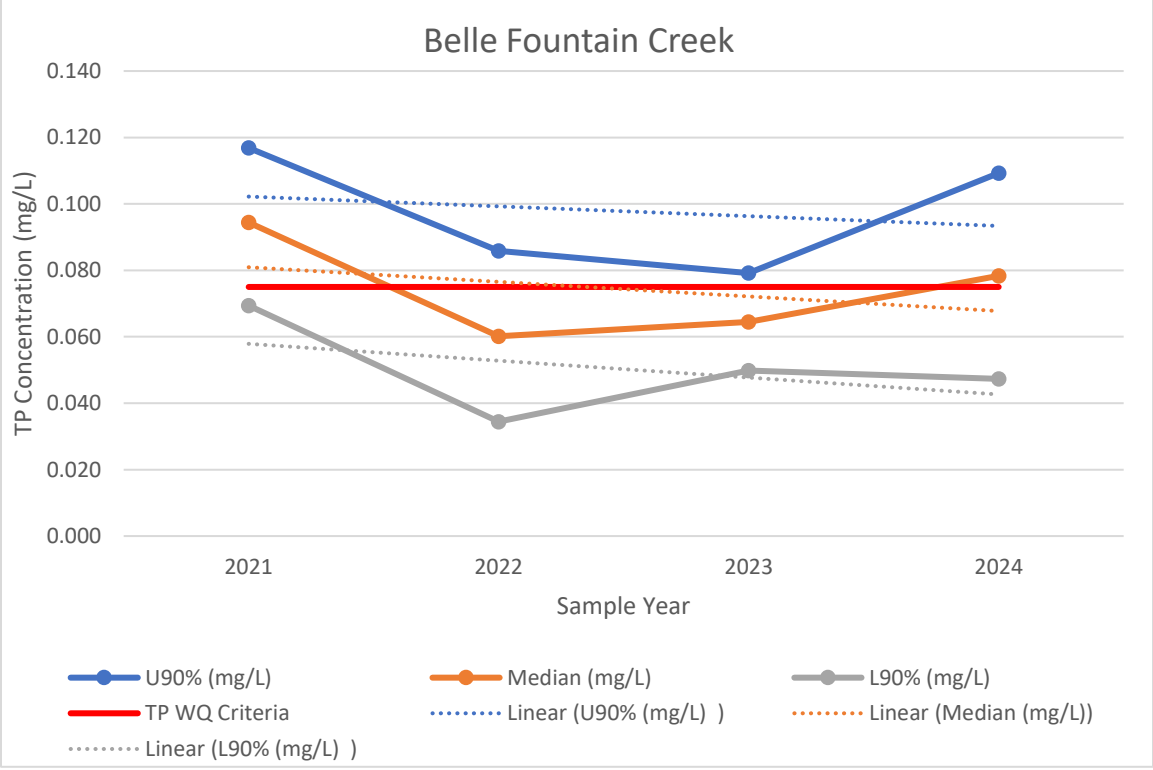
River	TP Calculation	2021	2022	2023	2024
Bear Creek	**U90% (mg/L)**	0.1678	0.2044	0.2149	0.232
	Median (mg/L)	0.117	0.168	0.171	0.191
	L90% (mg/L)	0.09297	0.1316	0.1261	0.150
	Relation to Criteria	Clearly Exceeds	Clearly Exceeds	Clearly Exceeds	Clearly Exceeds
Belle Fountain Creek	**U90% (mg/L)**	0.11686	0.0858	0.0792	0.109
	Median (mg/L)	0.0944	0.0602	0.0645	0.078
	L90% (mg/L)	0.06939	0.0345	0.0498	0.047
	Relation to Criteria	May Exceed	May Meet	May Meet	May Exceed
East Branch FDL River	**U90% (mg/L)**	0.31633	0.3865	0.1958	0.281
	Median (mg/L)	0.296	0.2890	0.1600	0.206
	L90% (mg/L)	0.21489	0.1915	0.1242	0.130
	Relation to Criteria	Clearly Exceeds	Clearly Exceeds	Clearly Exceeds	Clearly Exceeds
Embarrass River (STH 54)	**U90% (mg/L)**	0.09931	0.1057	0.0706	0.120
	Median (mg/L)	0.0825	0.0892	0.0558	0.092
	L90% (mg/L)	0.06145	0.0727	0.0409	0.065
	Relation to Criteria	Clearly Meets	May Meet	Clearly Meets	May Meet
Fox River	**U90% (mg/L)**	0.14288	0.1241	0.0833	0.147
	Median (mg/L)	0.09775	0.0891	0.0752	0.099
	L90% (mg/L)	0.07302	0.0541	0.0670	0.051
	Relation to Criteria	May Exceed	May Exceed	May Exceed	May Exceed
Grand River	**U90% (mg/L)**	0.18069	0.2010	0.2717	0.029
	Median (mg/L)	0.174	0.1610	0.2245	0.024
	L90% (mg/L)	0.11518	0.1210	0.1773	0.019
	Relation to Criteria	Clearly Exceeds	Clearly Exceeds	Clearly Exceeds	Clearly Meets
Little Wolf River	**U90% (mg/L)**	0.05411	0.0599	0.0417	0.120
	Median (mg/L)	0.0486	0.0511	0.0366	0.087
	L90% (mg/L)	0.03603	0.0422	0.0314	0.055
	Relation to Criteria	Clearly Meets	Clearly Meets	Clearly Meets	May Meet
Mecan River	**U90% (mg/L)**	0.06915	0.0605	0.0520	0.039
	Median (mg/L)	0.0603	0.0468	0.0399	0.029
	L90% (mg/L)	0.04103	0.0331	0.0277	0.019
	Relation to Criteria	Clearly Meets	Clearly Meets	Clearly Meets	Clearly Meets

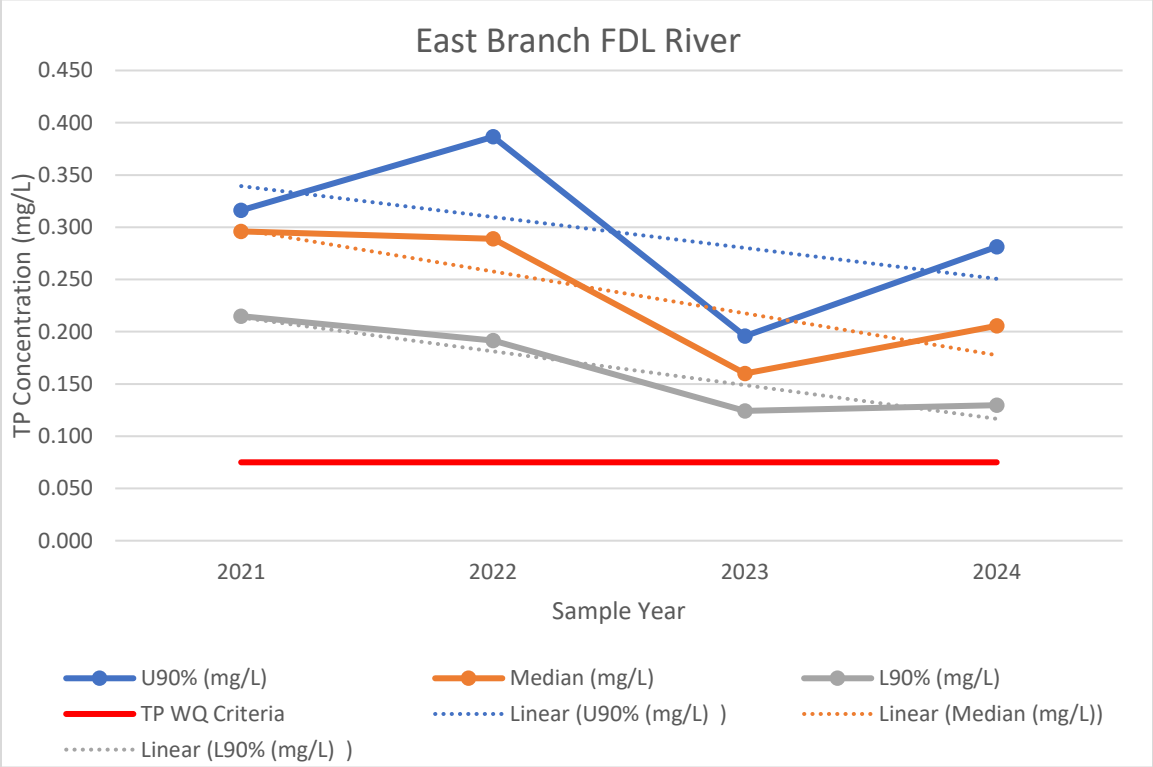
Montello River	**U90% (mg/L)**	0.11042	0.1099	0.0526	0.060
	Median (mg/L)	0.1002	0.0901	0.0445	0.043
	L90% (mg/L)	0.06758	0.0703	0.0363	0.025
	Relation to Criteria	May Exceed	May Exceed	Clearly Meets	Clearly Meets
Mud Creek	**U90% (mg/L)**	0.6824	0.9406	0.7975	0.283
	Median (mg/L)	0.6260	0.7815	0.6000	0.240
	L90% (mg/L)	0.569609575	0.6224	0.4025	0.197
	Relation to Criteria	Clearly Meets	Clearly Exceeds	Clearly Exceeds	Clearly Exceeds
Neenah Creek	**U90% (mg/L)**	0.15073	0.1098	0.1067	0.188
	Median (mg/L)	0.13	0.0892	0.0939	0.119
	L90% (mg/L)	0.10178	0.0686	0.0811	0.050
	Relation to Criteria	Clearly Exceeds	May Exceed	Clearly Exceeds	May Exceed
Pine River	**U90% (mg/L)**	0.087070636	0.0491	0.0399	0.045
	Median (mg/L)	0.0496	0.0424	0.0368	0.039
	L90% (mg/L)	0.012129364	0.0356	0.0337	0.033
	Relation to Criteria	Clearly Meets	Clearly Meets	Clearly Meets	Clearly Meets
Pipe Creek	**U90% (mg/L)**	0.328516516	0.2608	0.4231	0.495
	Median (mg/L)	0.2220	0.2205	0.2985	0.276
	L90% (mg/L)	0.1155	0.1802	0.1739	0.056
	Relation to Criteria	Clearly Exceeds	Clearly Exceeds	Clearly Exceeds	May Exceed
Red River	**U90% (mg/L)**	0.02607	0.0239	0.0264	0.037
	Median (mg/L)	0.02295	0.0178	0.0211	0.025
	L90% (mg/L)	0.01859	0.0116	0.0158	0.013
	Relation to Criteria	Clearly Meets	Clearly Meets	Clearly Meets	Clearly Meets
Shioc River	**U90% (mg/L)**	0.37548	0.3623	0.4322	0.308
	Median (mg/L)	0.3065	0.3148	0.3435	0.216
	L90% (mg/L)	0.2364	0.2672	0.2548	0.123
	Relation to Criteria	Clearly Exceeds	Clearly Exceeds	Clearly Exceeds	Clearly Exceeds
Waukau Creek	**U90% (mg/L)**	0.138	0.1788	0.1308	0.124
	Median (mg/L)	0.10785	0.1305	0.1032	0.079
	L90% (mg/L)	0.07286	0.0822	0.0755	0.033
	Relation to Criteria	May Exceed	Clearly Exceeds	Clearly Exceeds	May Exceed

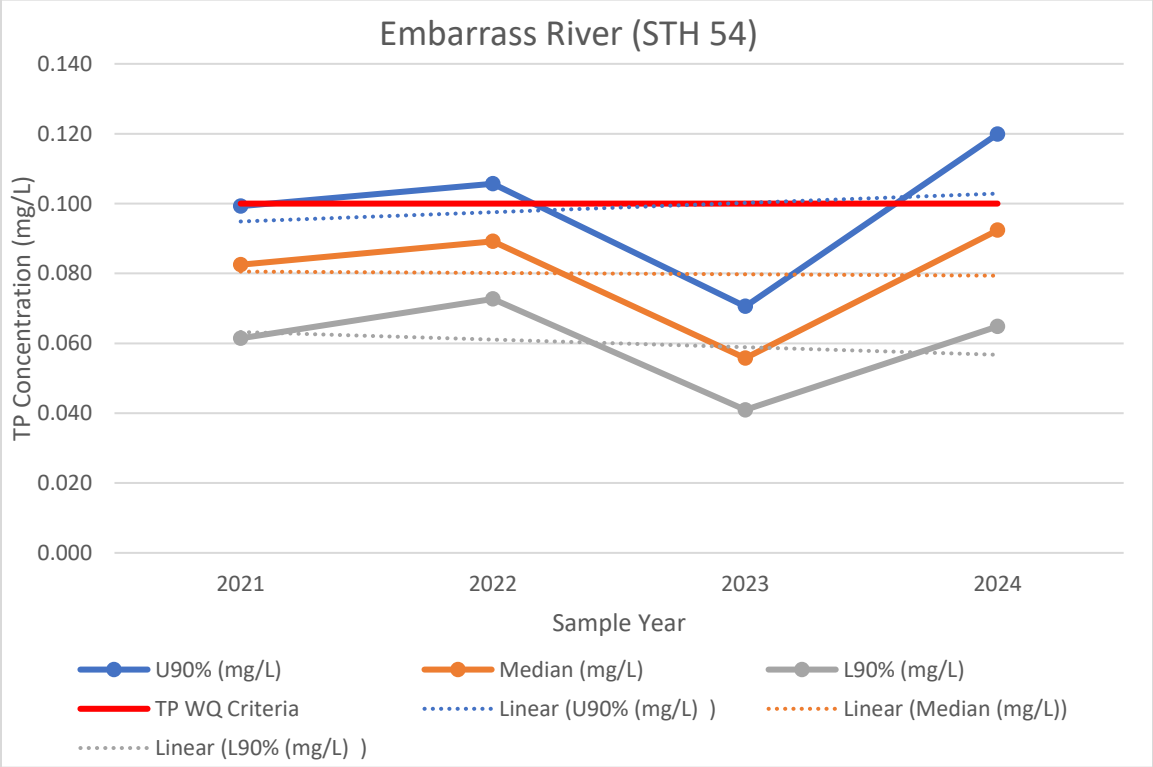
West Branch FDL River	**U90% (mg/L)**	0.3607	0.4996	0.6498	0.417
	Median (mg/L)	0.31	0.4095	0.4090	0.321
	L90% (mg/L)	0.19822	0.3194	0.1682	0.225
	Relation to Criteria	Clearly Exceeds	Clearly Exceeds	Clearly Exceeds	Clearly Exceeds
West Branch Wolf River	**U90% (mg/L)**	0.03794	0.0224	0.0243	0.021
	Median (mg/L)	0.0238	0.0189	0.0165	0.016
	L90% (mg/L)	0.01858	0.0153	0.0086	0.012
	Relation to Criteria	Clearly Meets	Clearly Meets	Clearly Meets	Clearly Meets
White River	**U90% (mg/L)**	0.03775	0.0423	0.0381	0.039
	Median (mg/L)	0.0289	0.0314	0.0310	0.029
	L90% (mg/L)	0.02435	0.0205	0.0239	0.018
	Relation to Criteria	Clearly Meets	Clearly Meets	Clearly Meets	Clearly Meets
Wolf River (CTH T)	**U90% (mg/L)**	0.03661	0.0300	0.0465	0.037
	Median (mg/L)	0.0343	0.0266	0.0350	0.033
	L90% (mg/L)	0.02939	0.0232	0.0235	0.029
	Relation to Criteria	Clearly Meets	Clearly Meets	Clearly Meets	Clearly Meets
Embarrass River (CTH M)	**U90% (mg/L)**	-	-	0.0372	0.058
	Median (mg/L)	-	-	0.0337	0.047
	L90% (mg/L)	-	-	0.0302	0.035
	Relation to Criteria	-	-	Clearly Meets	Clearly Meets
Pigeon River	**U90% (mg/L)**	-	-	0.0735	0.088
	Median (mg/L)	-	-	0.0671	0.078
	L90% (mg/L)	-	-	0.0606	0.067
	Relation to Criteria	-	-	Clearly Meets	May Exceed
Sawyer Creek	**U90% (mg/L)**	-	-	0.1373	0.246
	Median (mg/L)	-	-	0.1032	0.120
	L90% (mg/L)	-	-	0.0691	-0.007
	Relation to Criteria	-	-	May Exceed	May Exceed
Waupaca River	**U90% (mg/L)**	-	-	0.0313	0.051
	Median (mg/L)	-	-	0.0273	0.039
	L90% (mg/L)	-	-	0.0233	0.027
	Relation to Criteria	-	-	Clearly Meets	Clearly Meets

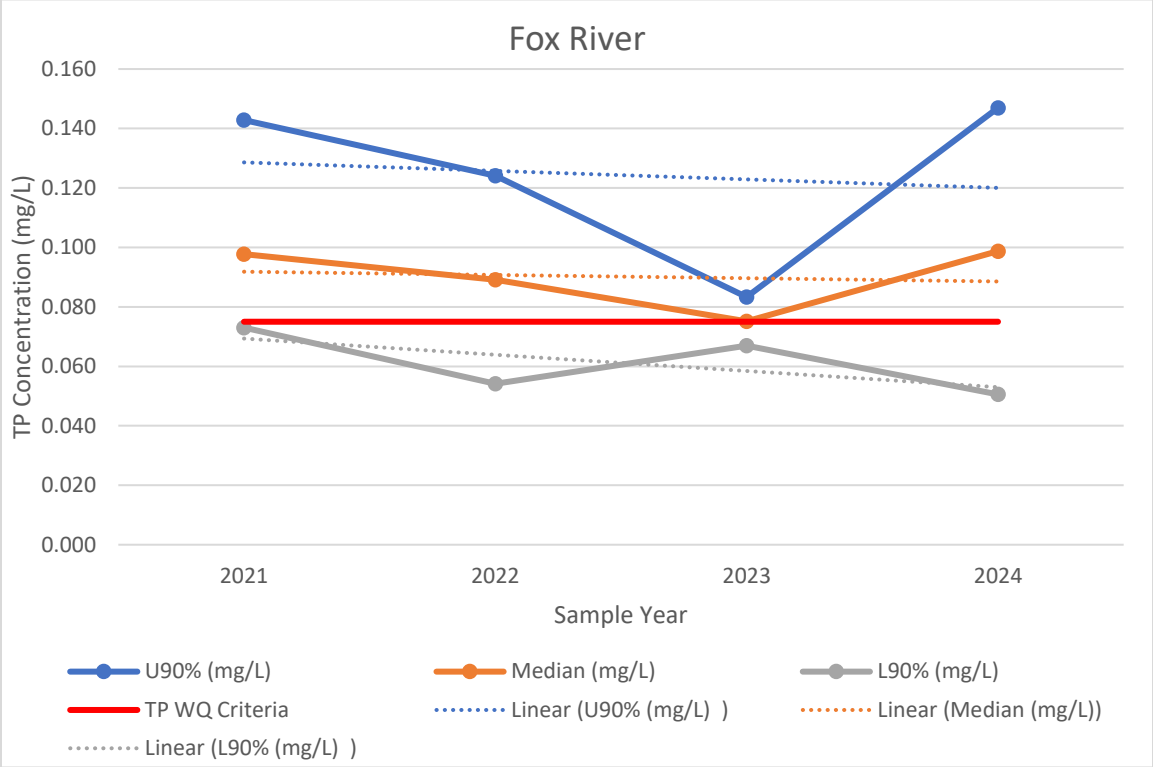
Appendix E: Confidence Interval Graphs

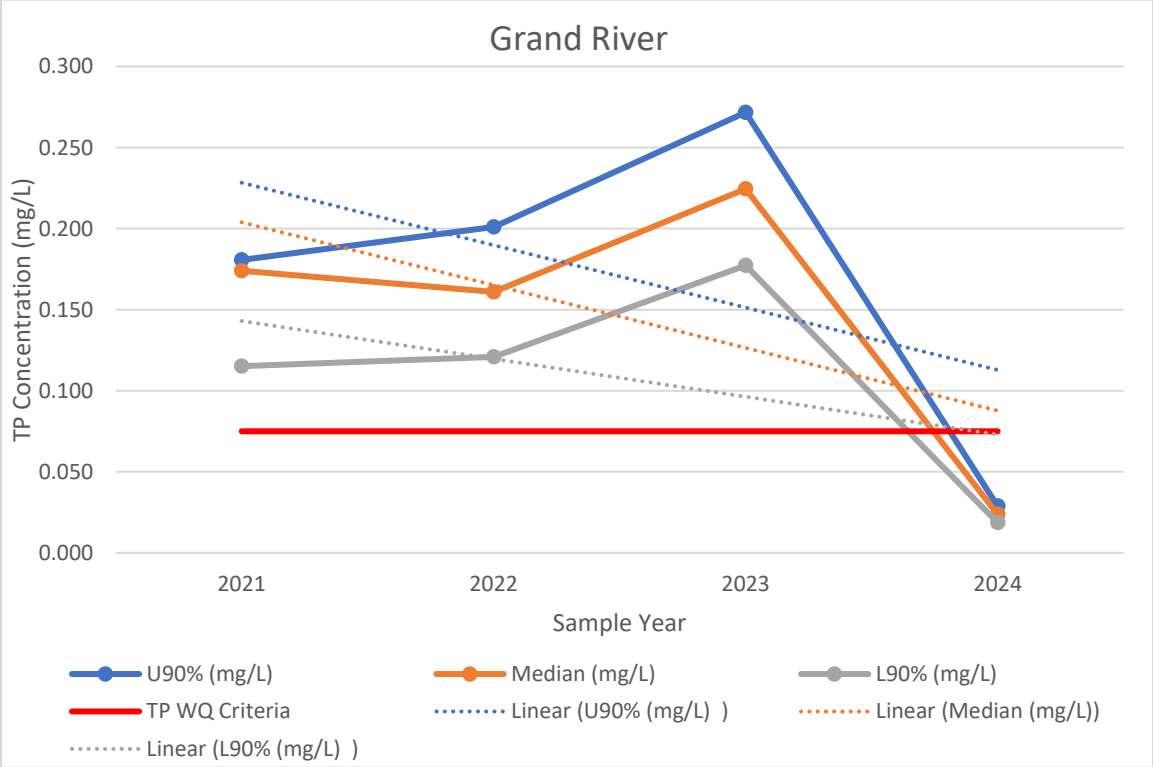


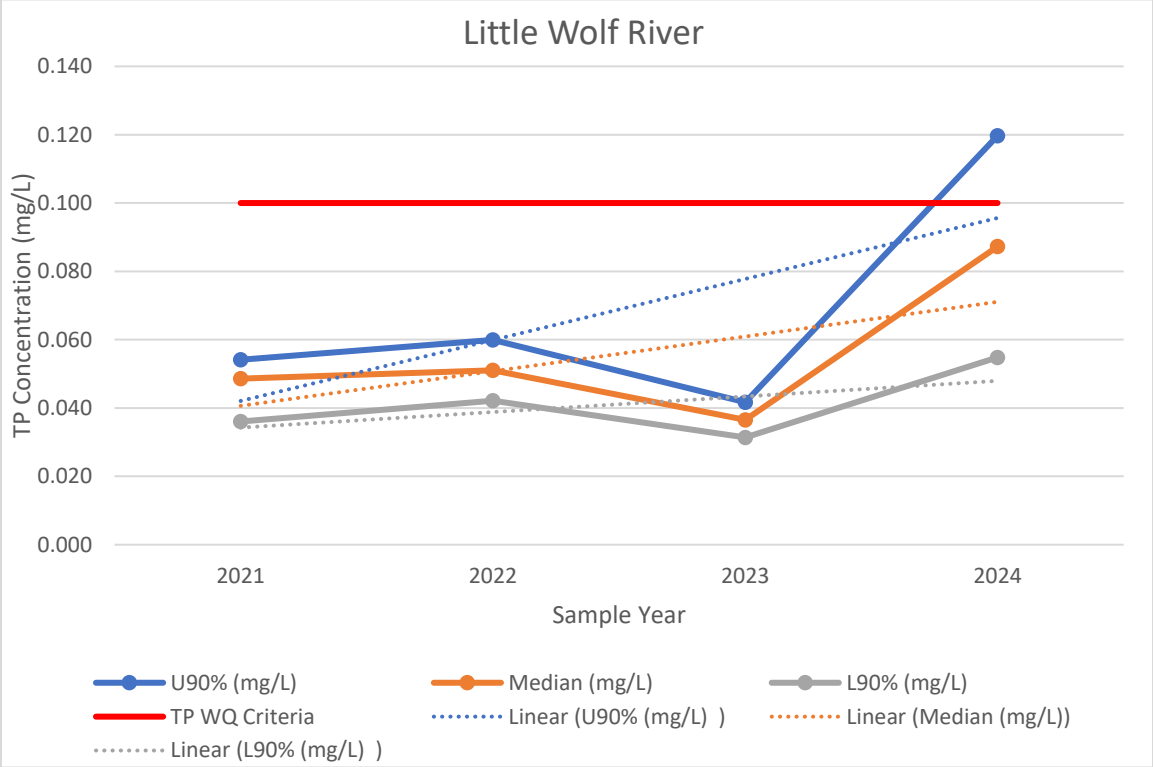


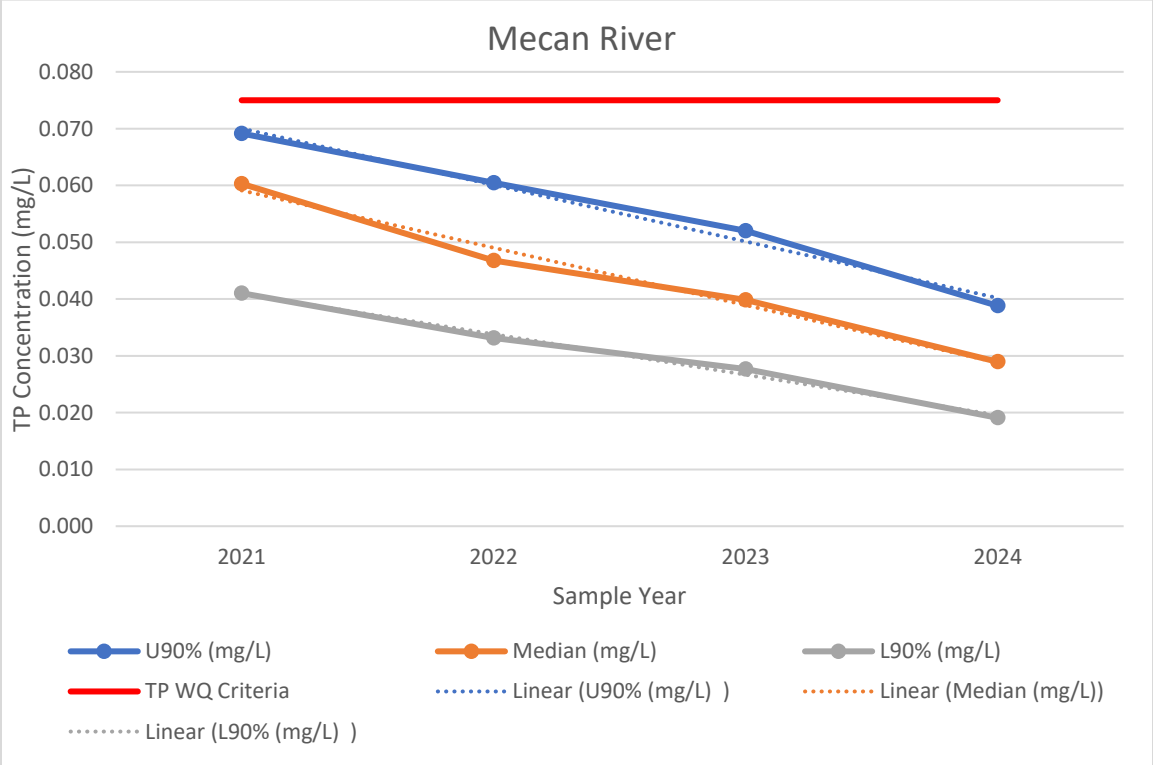

East Branch FDL River
0.450
0.400
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
TP Concentration (mg/L)
2021
2022
2023
2024
Sample Year
U90% (mg/L)
Median (mg/L)
L90% (mg/L)
TP WQ Criteria
Linear (U90% (mg/L))
Linear (Median (mg/L))
Linear (L90% (mg/L))

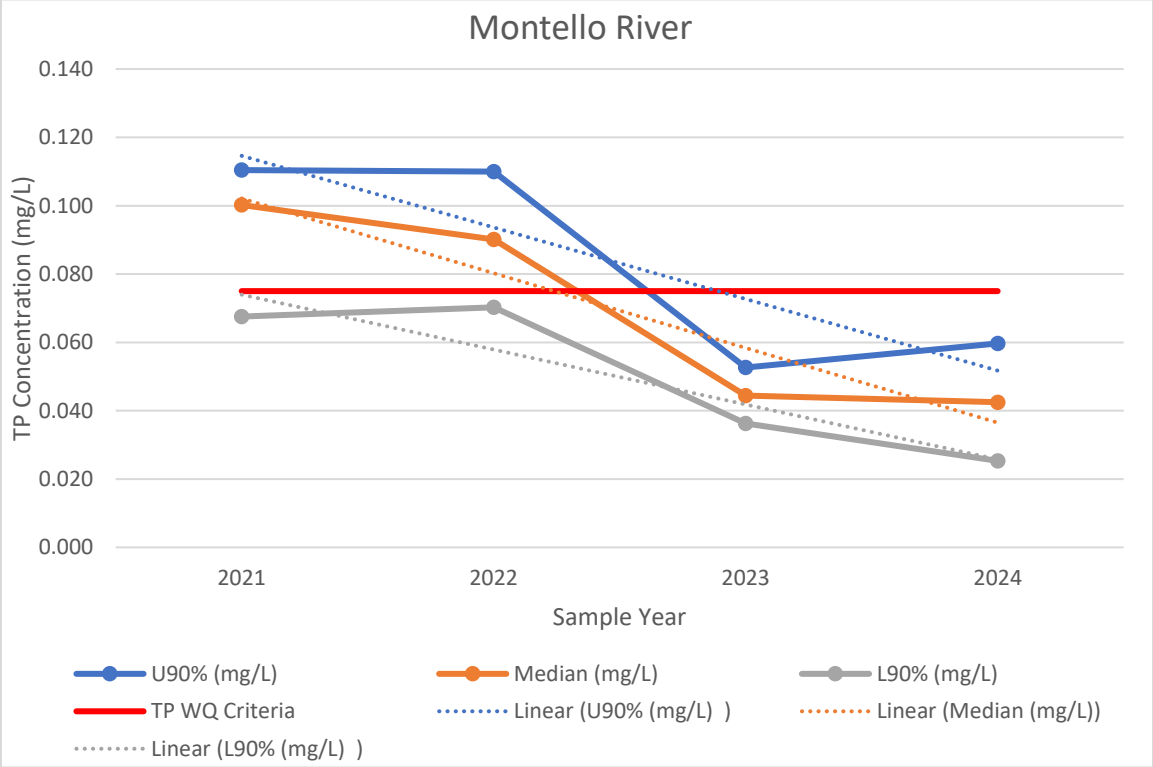

Embarrass River (STH 54)
0.140
0.120
0.100
0.080
0.060
0.040
0.020
0.000
TP Concentration (mg/L)
2021
2022
2023
2024
Sample Year
U90% (mg/L)
Median (mg/L)
L90% (mg/L)
TP WQ Criteria
Linear (U90% (mg/L))
Linear (Median (mg/L))
Linear (L90% (mg/L))

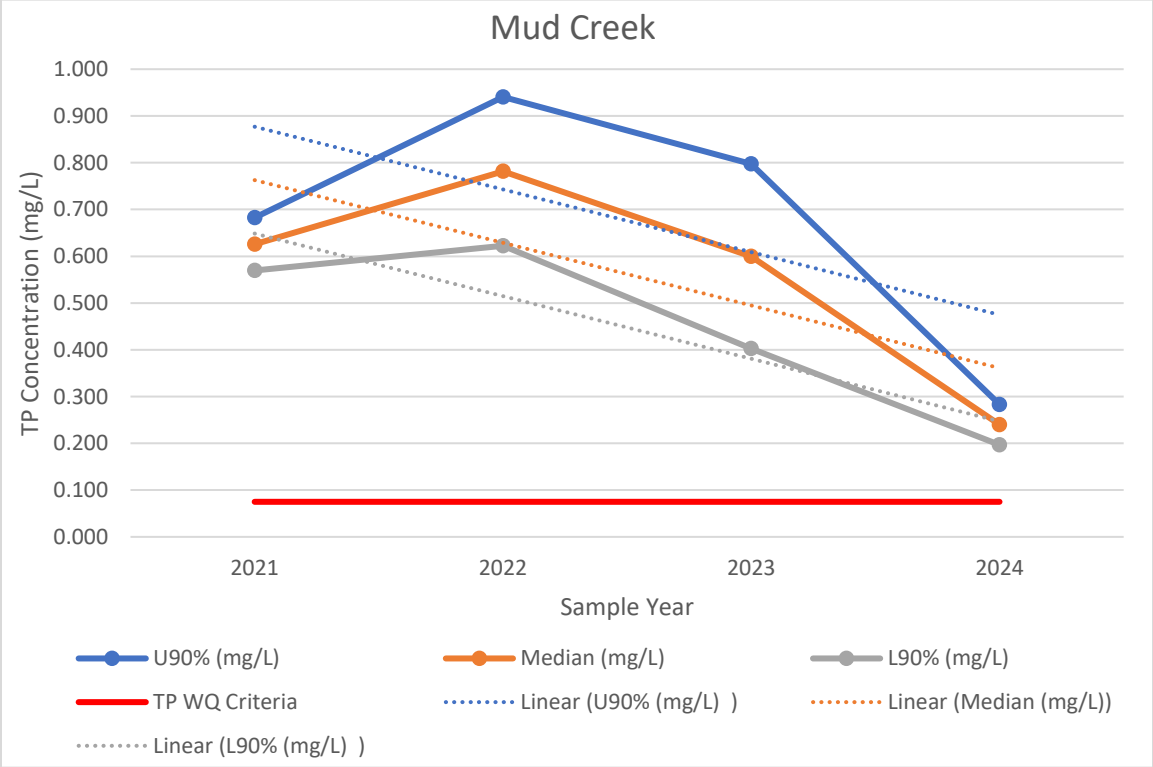

Fox River
TP Concentration (mg/L)
0.160
0.140
0.120
0.100
0.080
0.060
0.040
0.020
0.000
2021
2022
2023
2024
Sample Year
U90% (mg/L)
Median (mg/L)
L90% (mg/L)
TP WQ Criteria
Linear (U90% (mg/L))
Linear (Median (mg/L))
Linear (L90% (mg/L))

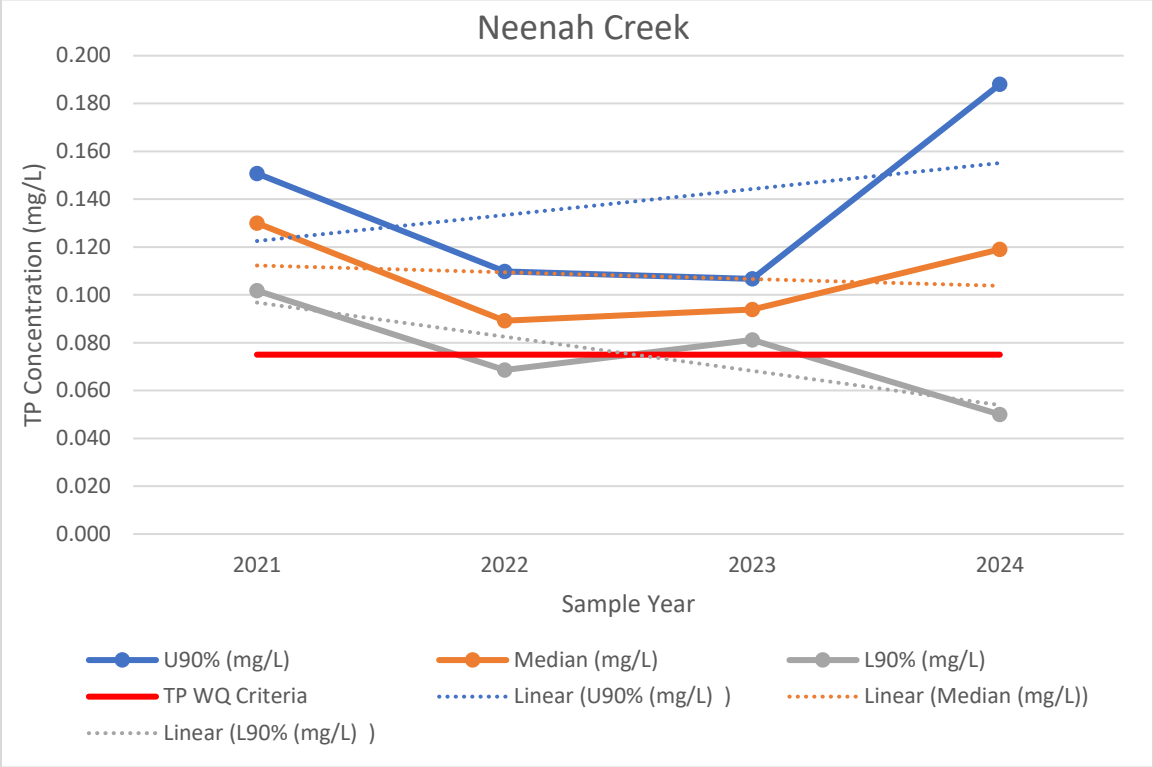

Grand River
TP Concentration (mg/L)
0.300
0.250
0.200
0.150
0.100
0.050
0.000
2021
2022
2023
2024
Sample Year
U90% (mg/L)
Median (mg/L)
L90% (mg/L)
TP WQ Criteria
Linear (U90% (mg/L))
Linear (Median (mg/L))
Linear (L90% (mg/L))

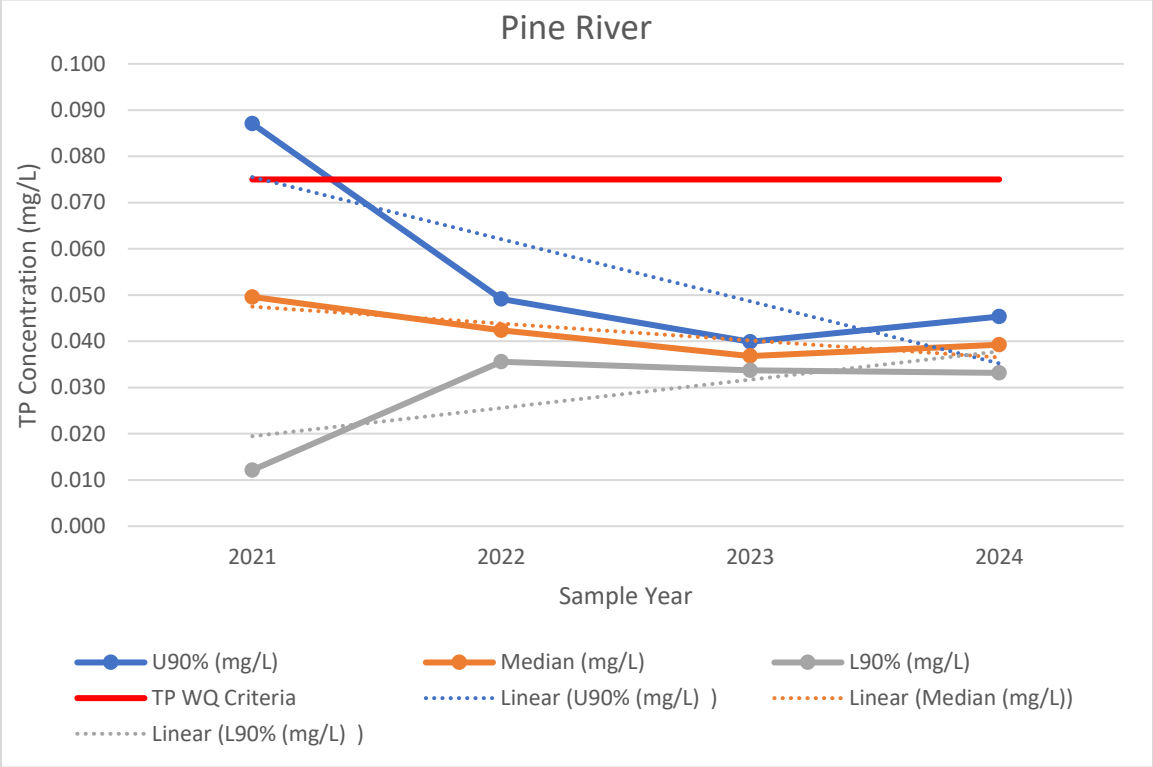

Little Wolf River
0.140
0.120
0.100
0.080
0.060
0.040
0.020
0.000
TP Concentration (mg/L)
2021
2022
2023
2024
Sample Year
U90% (mg/L)
Median (mg/L)
L90% (mg/L)
TP WQ Criteria
Linear (U90% (mg/L))
Linear (Median (mg/L))
Linear (L90% (mg/L))

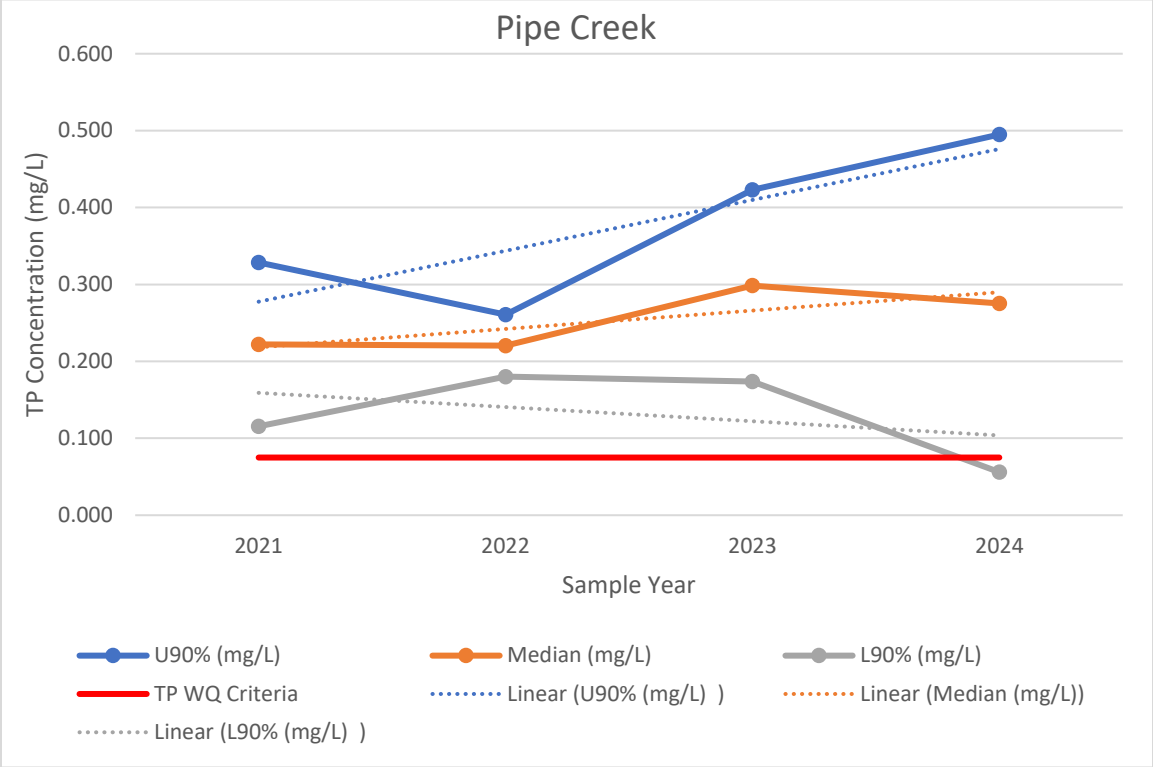

Mecan River
0.080
0.070
0.060
0.050
0.040
0.030
0.020
0.010
0.000
TP Concentration (mg/L)
2021
2022
2023
2024
Sample Year
U90% (mg/L)
Median (mg/L)
L90% (mg/L)
TP WQ Criteria
Linear (U90% (mg/L))
Linear (Median (mg/L))
Linear (L90% (mg/L))

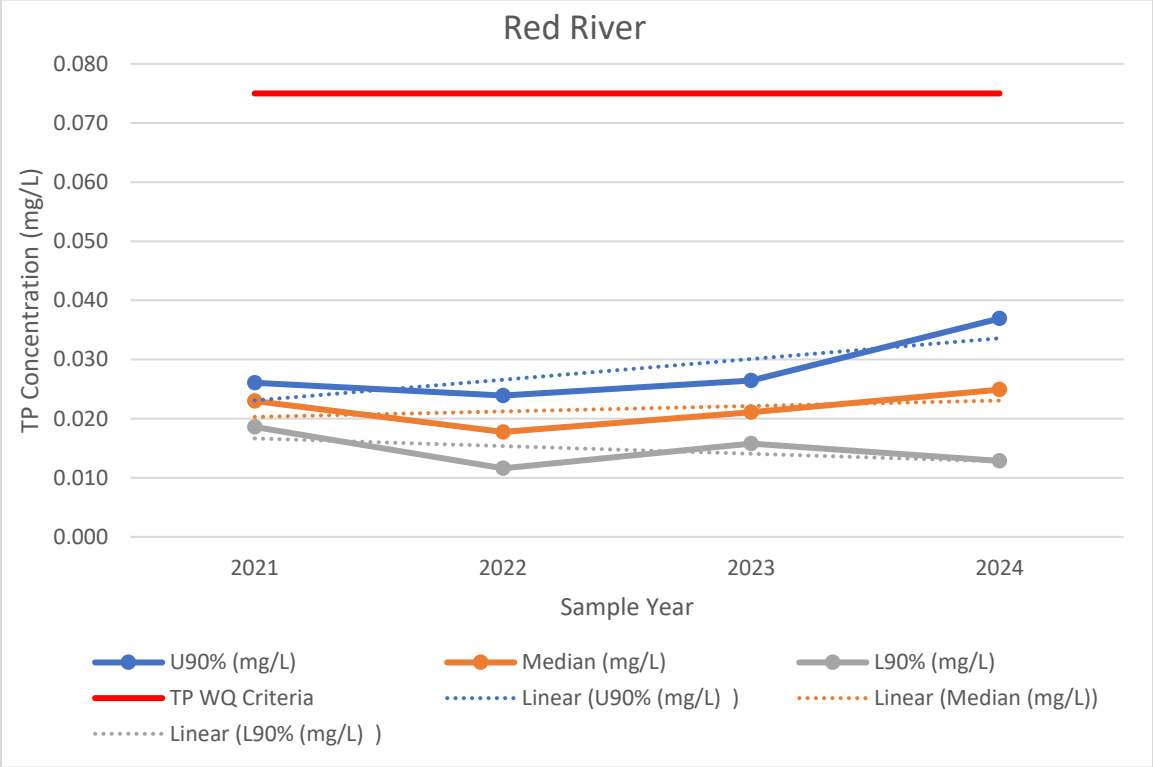

Montello River
0.140
0.120
0.100
0.080
0.060
0.040
0.020
0.000
TP Concentration (mg/L)
2021
2022
2023
2024
Sample Year
U90% (mg/L)
Median (mg/L)
L90% (mg/L)
TP WQ Criteria
Linear (U90% (mg/L))
Linear (Median (mg/L))
Linear (L90% (mg/L))

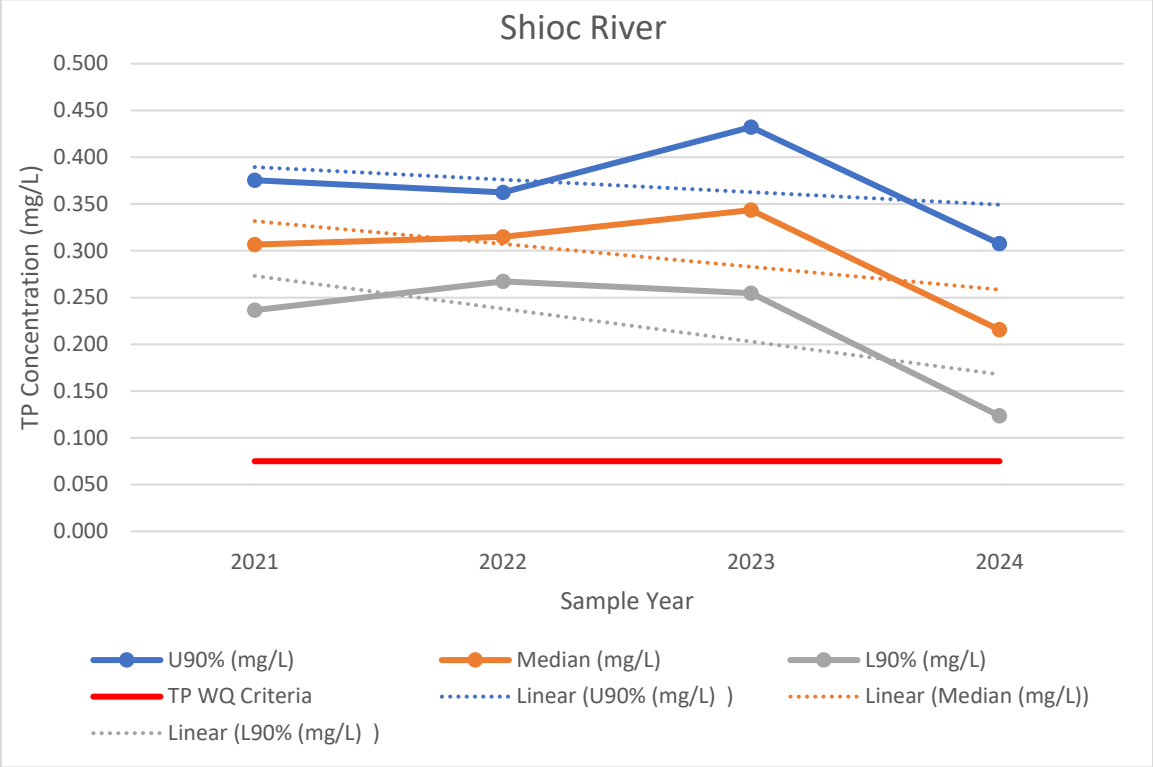

Mud Creek
1.000
0.900
0.800
0.700
0.600
0.500
0.400
0.300
0.200
0.100
0.000
TP Concentration (mg/L)
2021
2022
2023
2024
Sample Year
U90% (mg/L)
Median (mg/L)
L90% (mg/L)
TP WQ Criteria
Linear (U90% (mg/L))
Linear (Median (mg/L))
Linear (L90% (mg/L))

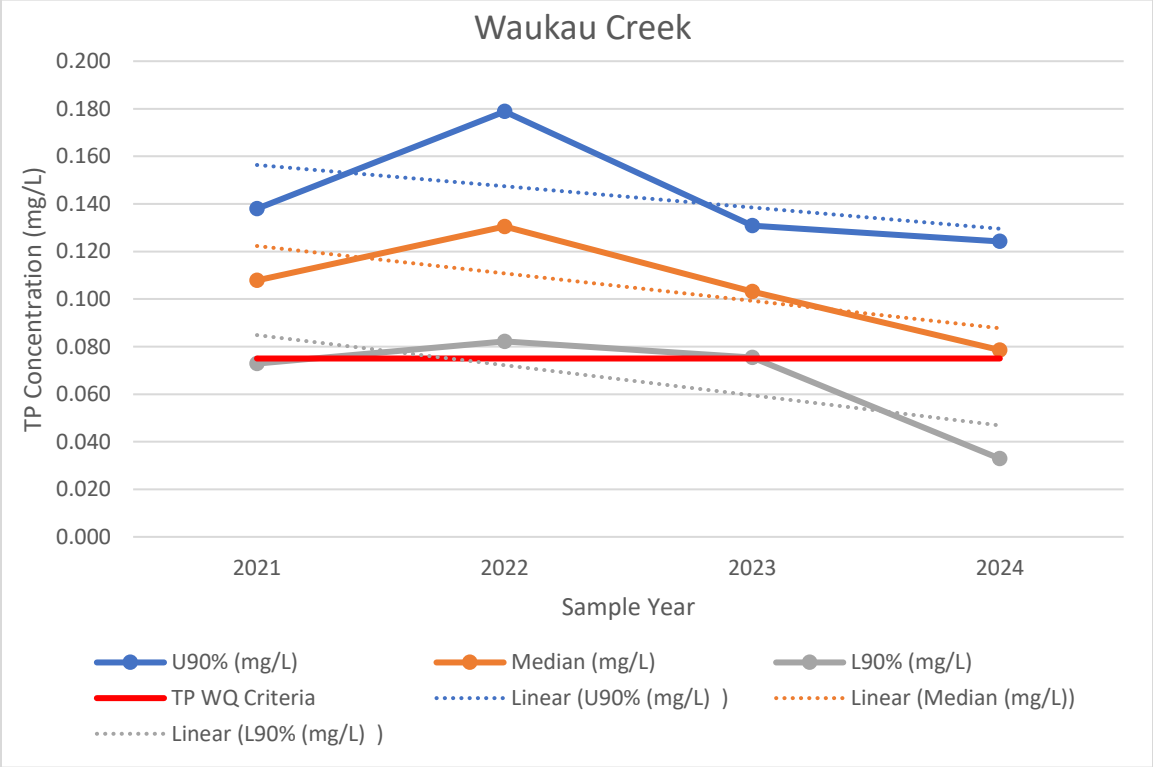

Neenah Creek
TP Concentration (mg/L)
0.200
0.180
0.160
0.140
0.120
0.100
0.080
0.060
0.040
0.020
0.000
2021
2022
2023
2024
Sample Year
U90% (mg/L)
Median (mg/L)
L90% (mg/L)
TP WQ Criteria
Linear (U90% (mg/L))
Linear (Median (mg/L))
Linear (L90% (mg/L))

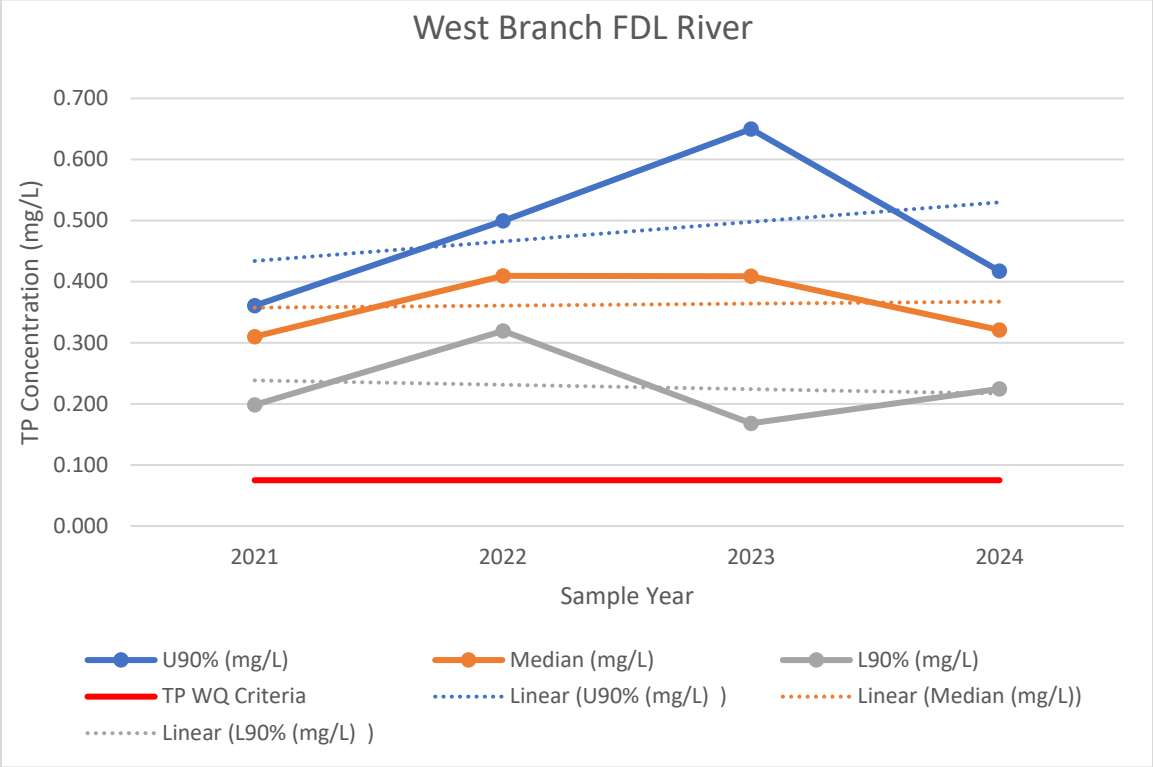

Pine River
TP Concentration (mg/L)
0.100
0.090
0.080
0.070
0.060
0.050
0.040
0.030
0.020
0.010
0.000
2021
2022
2023
2024
Sample Year
U90% (mg/L)
Median (mg/L)
L90% (mg/L)
TP WQ Criteria
Linear (U90% (mg/L))
Linear (Median (mg/L))
Linear (L90% (mg/L))

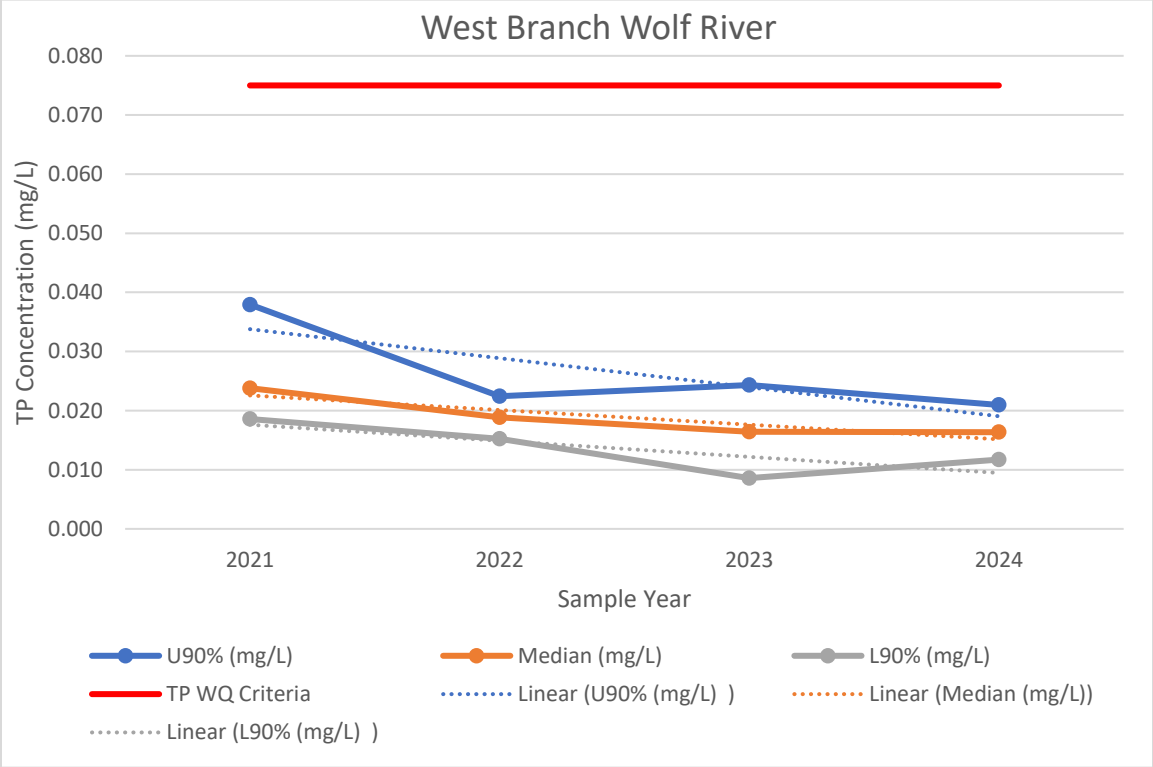

Pipe Creek
0.600
0.500
0.400
0.300
0.200
0.100
0.000
TP Concentration (mg/L)
2021
2022
2023
2024
Sample Year
U90% (mg/L)
Median (mg/L)
L90% (mg/L)
TP WQ Criteria
Linear (U90% (mg/L))
Linear (Median (mg/L))
Linear (L90% (mg/L))

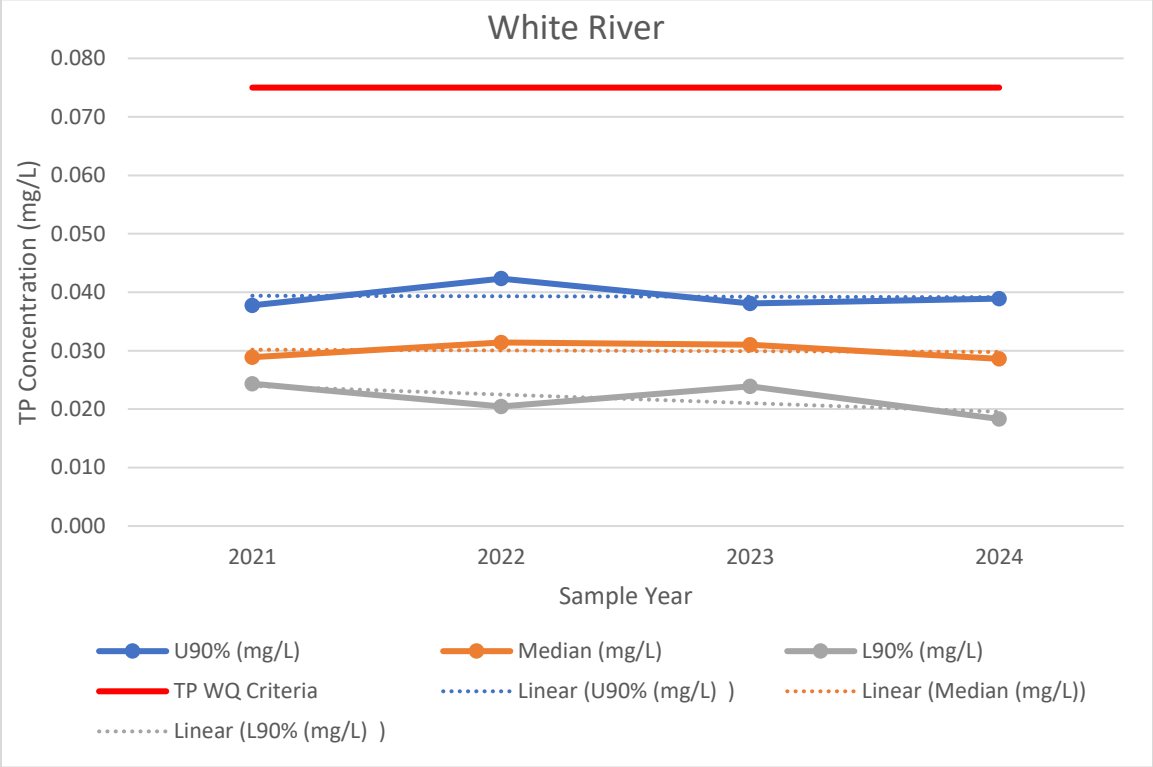

Red River
0.080
0.070
0.060
0.050
0.040
0.030
0.020
0.010
0.000
TP Concentration (mg/L)
2021
2022
2023
2024
Sample Year
U90% (mg/L)
Median (mg/L)
L90% (mg/L)
TP WQ Criteria
Linear (U90% (mg/L))
Linear (Median (mg/L))
Linear (L90% (mg/L))

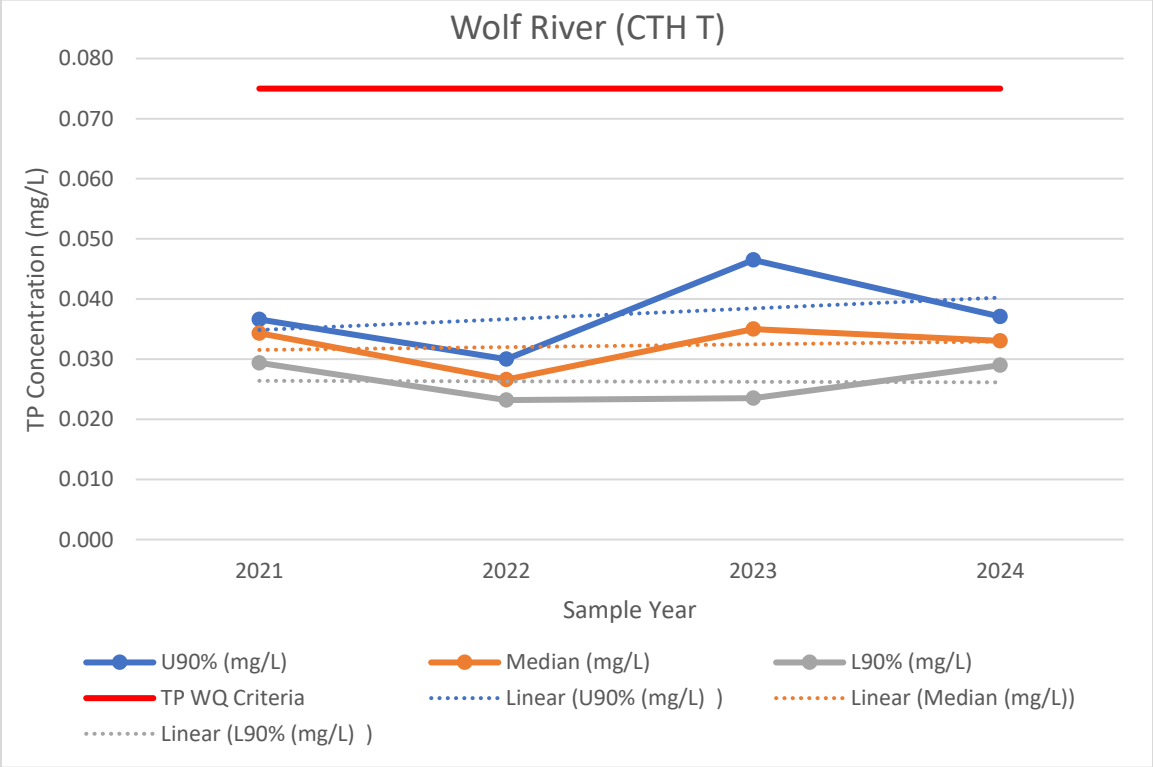

Shioc River
0.500
0.450
0.400
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
TP Concentration (mg/L)
2021
2022
2023
2024
Sample Year
U90% (mg/L)
Median (mg/L)
L90% (mg/L)
TP WQ Criteria
Linear (U90% (mg/L))
Linear (Median (mg/L))
Linear (L90% (mg/L))


Waukau Creek
0.200
0.180
0.160
0.140
0.120
0.100
0.080
0.060
0.040
0.020
0.000
TP Concentration (mg/L)
2021
2022
2023
2024
Sample Year
U90% (mg/L)
Median (mg/L)
L90% (mg/L)
TP WQ Criteria
Linear (U90% (mg/L))
Linear (Median (mg/L))
Linear (L90% (mg/L))

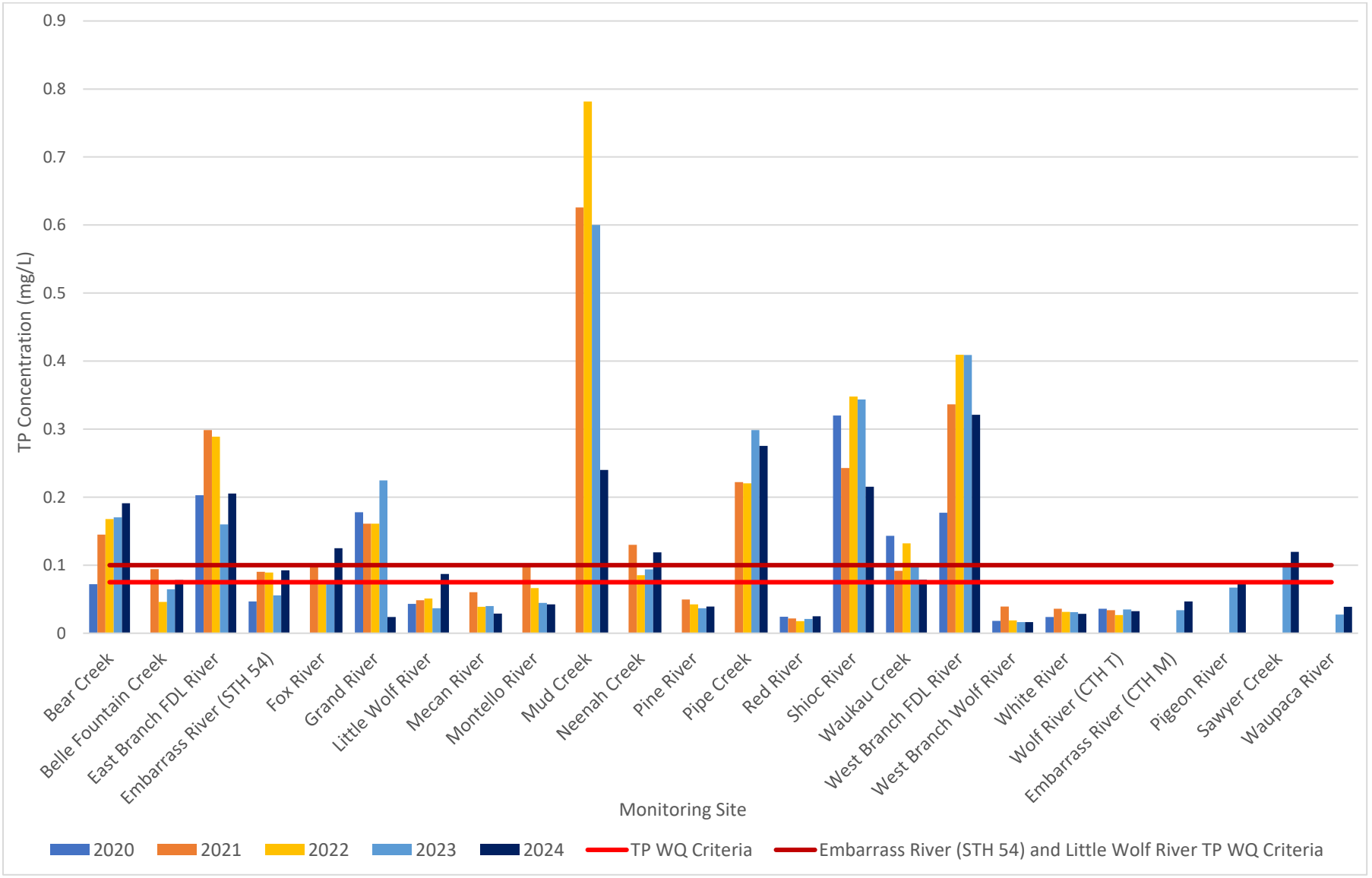

West Branch FDL River
TP Concentration (mg/L)
0.700
0.600
0.500
0.400
0.300
0.200
0.100
0.000
2021
2022
2023
2024
Sample Year
U90% (mg/L)
Median (mg/L)
L90% (mg/L)
TP WQ Criteria
Linear (U90% (mg/L))
Linear (Median (mg/L))
Linear (L90% (mg/L))


West Branch Wolf River
TP Concentration (mg/L)
0.080
0.070
0.060
0.050
0.040
0.030
0.020
0.010
0.000
2021
2022
2023
2024
Sample Year
U90% (mg/L)
Median (mg/L)
L90% (mg/L)
TP WQ Criteria
Linear (U90% (mg/L))
Linear (Median (mg/L))
Linear (L90% (mg/L))


White River
0.080
0.070
0.060
0.050
0.040
0.030
0.020
0.010
0.000
TP Concentration (mg/L)
2021
2022
2023
2024
Sample Year
U90% (mg/L)
Median (mg/L)
L90% (mg/L)
TP WQ Criteria
Linear (U90% (mg/L))
Linear (Median (mg/L))
Linear (L90% (mg/L))


Wolf River (CTH T)
0.080
0.070
0.060
0.050
0.040
0.030
0.020
0.010
0.000
TP Concentration (mg/L)
2021
2022
2023
2024
Sample Year
U90% (mg/L)
Median (mg/L)
L90% (mg/L)
TP WQ Criteria
Linear (U90% (mg/L))
Linear (Median (mg/L))
Linear (L90% (mg/L))

Appendix F: Median Total Phosphorus Concentration by Monitoring Site



Appendix G: Percentage of Total Phosphorus Concentrations from Dissolved Reactive Phosphorus

DRP % of TP						
Monitoring Site	Month	2020	2021	2022	2023	2024
Bear Creek	May	-	-	50%	54%	59%
	June	-	***82%***	***72%***	***65%***	***64%***
	July	-	***71%***	***84%***	***75%***	***76%***
	August	-	***77%***	***84%***	***76%***	***80%***
	September	57%	***67%***	***78%***	***70%***	***79%***
	October	82%	***74%***	62%	***79%***	***74%***
Belle Fountain Creek	May	-	29%	30%	16%	21%
	June	-	20%	-	25%	***56%***
	July	-	20%	49%	26%	34%
	August	-	56%	-	32%	37%
	September	-	50%	37%	45%	44%
	October	-	63%	32%	50%	59%
East Branch FDL River	May	-	***71%***	***74%***	***67%***	***80%***
	June	-	***61%***	***58%***	***71%***	***70%***
	July	-	***80%***	***65%***	***75%***	***65%***
	August	***88%***	***82%***	***81%***	***66%***	***68%***
	September	***82%***	***78%***	***75%***	53%	***75%***
	October	***90%***	***84%***	63%	***68%***	***79%***
Embarrass River (STH 54)	May	-	45%	47%	52%	54%
	June	-	13%	35%	17%	44%
	July	-	11%	10%	7%	63%
	August	-	62%	14%	11%	45%
	September	42%	34%	27%	25%	49%
	October	87%	51%	51%	16%	42%
Fox River	May	-	27%	-	35%	25%
	June	-	50%	34%	46%	41%
	July	-	***48%***	64%	53%	***50%***
	August	-	62%	-	62%	61%
	September	-	70%	-	67%	41%
	October	-	58%	54%	53%	-
Grand River	May	-	***61%***	49%	31%	36%
	June	-	***77%***	***84%***	***77%***	52%
	July	-	***83%***	***76%***	***85%***	63%
	August	***98%***	***93%***	***69%***	***78%***	38%
	September	***73%***	76%	***85%***	***85%***	48%
	October	***42%***	82%	52%	***79%***	55%

Little Wolf River	May	-	50%	37%	31%	43%
	June	-	59%	39%	26%	45%
	July	-	52%	41%	45%	28%
	August	-	77%	47%	39%	28%
	September	50%	43%	53%	45%	16%
	October	132%	61%	55%	27%	47%
Mecan River	May	-	22%	16%	15%	23%
	June	-	18%	-	22%	26%
	July	-	75%	12%	15%	25%
	August	-	39%	-	23%	31%
	September	-	59%	32%	9%	30%
	October	-	27%	27%	34%	33%
Montello River	May	-	31%	34%	37%	55%
	June	-	38%	-	51%	51%
	July	-	12%	37%	62%	49%
	August	-	62%	-	52%	55%
	September	-	52%	48%	56%	54%
	October	-	29%	29%	48%	59%
Mud Creek	May	-	***87%***	***81%***	58%	***86%***
	June	-	-	***80%***	***67%***	***76%***
	July	-	***92%***	***88%***	***79%***	***71%***
	August	-	***84%***	***84%***	***89%***	***84%***
	September	-	***97%***	***94%***	***92%***	***81%***
	October	-	***81%***	***93%***	***91%***	***77%***
Neenah Creek	May	-	20%	-	8%	9%
	June	-	19%	16%	14%	37%
	July	-	25%	15%	9%	***30%***
	August	-	18%	-	10%	21%
	September	-	7%	18%	15%	25%
	October	-	7%	15%	12%	34%
Pine River	May	-	-	14%	38%	48%
	June	-	16%	35%	20%	47%
	July	-	29%	37%	58%	32%
	August	-	28%	45%	43%	41%
	September	-	40%	39%	45%	47%
	October	-	8%	61%	24%	55%
Pipe Creek	May	-	-	20%	54%	***45%***
	June	-	***84%***	***83%***	***66%***	51%
	July	-	***83%***	7%	***60%***	***76%***
	August	-	***88%***	***71%***	***38%***	40%
	September	-	***81%***	***45%***	***18%***	***67%***
	October	-	***76%***	***84%***	***52%***	***74%***

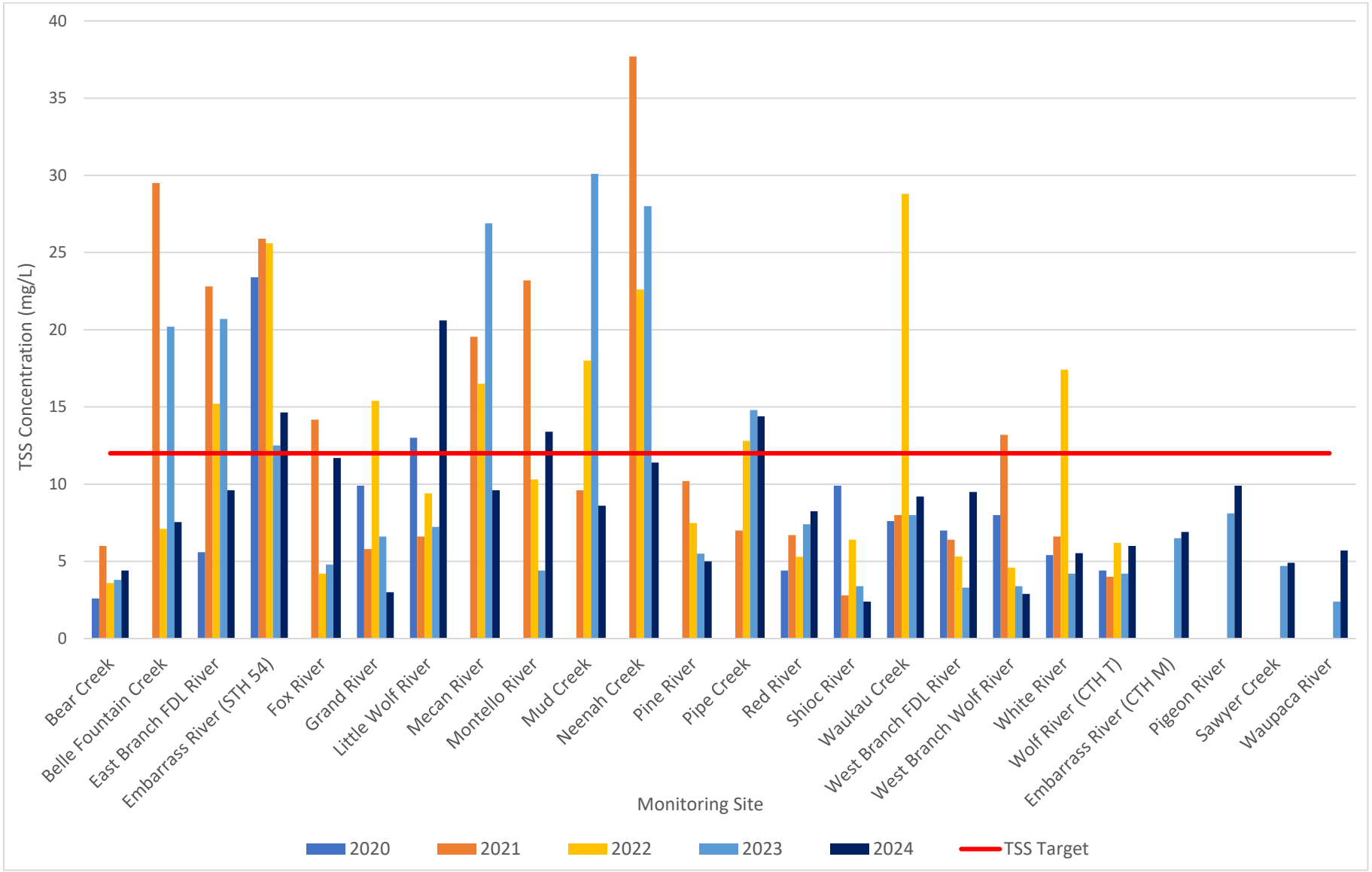
Red River	May	-	-	23%	0%	24%
	June	-	33%	33%	33%	30%
	July	-	82%	22%	30%	39%
	August	85%	65%	41%	32%	21%
	September	89%	27%	30%	40%	33%
	October	180%	26%	-	ND	56%
Shioc River	May	-	-	***58%***	50%	46%
	June	-	***78%***	***81%***	***67%***	***84%***
	July	-	***59%***	***78%***	***88%***	***79%***
	August	-	***79%***	***79%***	***92%***	***72%***
	September	***53%***	***82%***	***56%***	***81%***	***84%***
	October	***70%***	***75%***	-	***79%***	***79%***
Waukau Creek	May	-	47%	17%	40%	40%
	June	-	***78%***	45%	***68%***	64%
	July	-	-	***74%***	***78%***	***83%***
	August	***46%***	***67%***	***69%***	***77%***	72%
	September	74%	29%	***38%***	70%	65%
	October	***68%***	53%	0%	37%	55%
West Branch FDL River	May	-	***80%***	***77%***	***72%***	***71%***
	June	-	***85%***	***79%***	***81%***	***80%***
	July	-	***64%***	***84%***	***87%***	***70%***
	August	***80%***	***83%***	***87%***	***89%***	***77%***
	September	***101%***	***78%***	***71%***	***81%***	-
	October	***96%***	***86%***	***71%***	***72%***	***65%***
West Branch Wolf River	May	-	-	30%	35%	33%
	June	-	23%	28%	0%	-
	July	-	39%	26%	0%	0%
	August	-	5%	43%	43%	39%
	September	134%	35%	36%	43%	54%
	October	98%	19%	39%	11%	50%
White River	May	-	30%	27%	14%	19%
	June	-	33%	20%	18%	29%
	July	-	38%	36%	16%	38%
	August	63%	35%	29%	28%	22%
	September	122%	33%	40%	ND	28%
	October	71%	38%	37%	39%	56%
Wolf River (CTH T)	May	-	14%	31%	9%	28%
	June	-	26%	31%	0%	17%
	July	-	26%	27%	23%	38%
	August	51%	12%	19%	15%	-
	September	71%	25%	29%	31%	29%
	October	74%	40%	24%	11%	33%

Embarrass River (CTH M)	May	-	-	-	30%	45%
	June	-	-	-	22%	55%
	July	-	-	-	18%	56%
	August	-	-	-	27%	71%
	September	-	-	-	24%	44%
	October	-	-	-	35%	46%
Pigeon River	May	-	-	-	26%	31%
	June	-	-	-	30%	41%
	July	-	-	-	31%	54%
	August	-	-	-	20%	45%
	September	-	-	-	19%	23%
	October	-	-	-	20%	23%
Sawyer Creek	May	-	-	-	36%	40%
	June	-	-	-	58%	64%
	July	-	-	-	***80%***	***72%***
	August	-	-	-	***66%***	63%
	September	-	-	-	49%	***73%***
	October	-	-	-	61%	***88%***
Waupaca River	May	-	-	-	34%	37%
	June	-	-	-	33%	35%
	July	-	-	-	60%	44%
	August	-	-	-	48%	52%
	September	-	-	-	54%	51%
	October	-	-	-	22%	47%

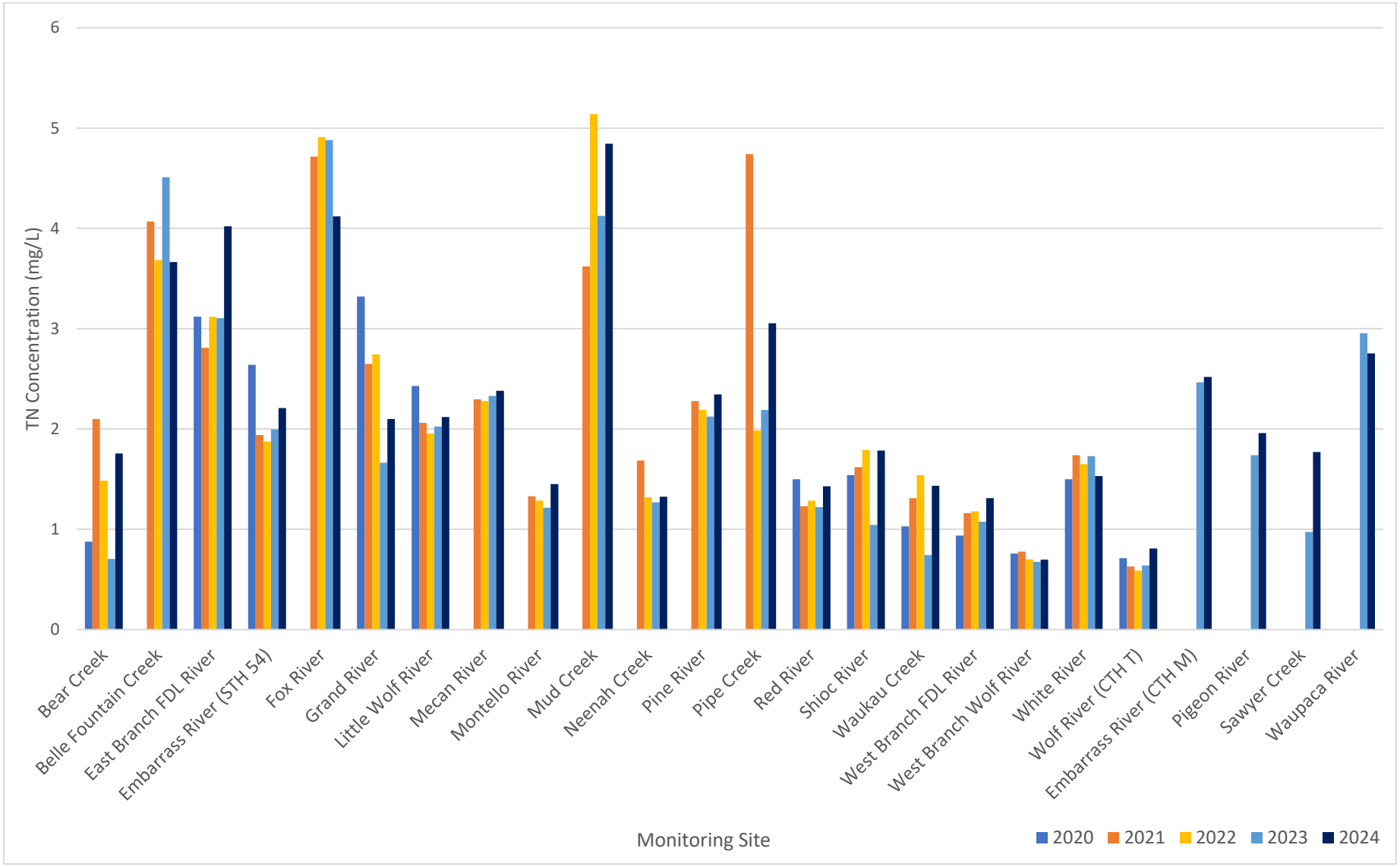
Red percentages indicate the DRP concentration exceeded the TP concentration (DRP >100%).

Italicized and bold percentages indicate the DRP sample concentration was <u>above</u> the TP WQC.

Appendix H: Median Total Suspended Solids Concentration by Monitoring Site



Appendix I: Median Total Nitrogen Concentration by Monitoring Site



Appendix J: 2020-2024 Sampling Data

TP (mg/L)						
Stream Name	Month	2020	2021	2022	2023	2024
Bear Creek	May	-	-	0.0871	0.0686	0.096
	June	-	0.324	0.167	0.162	0.18
	July	-	0.163	0.217	0.179	0.258
	August	-	0.145	0.194	0.203	0.286
	September	0.0576	0.117	0.169	0.152	0.193
	October	0.0867	0.106	0.0686	0.291	0.189
Belle Fountain Creek	May	-	0.0969	0.056	0.11	0.12
	June	-	0.143	-	0.0614	0.166
	July	-	0.132	0.036	0.0676	0.102
	August	-	0.0919	-	0.0714	0.0484
	September	-	0.0726	0.0643	0.0552	0.0546
	October	-	0.0437	0.0301	0.0383	0.0354
East Branch FDL River	May	-	0.298	0.318	0.159	0.23
	June	-	0.299	0.445	0.223	0.338
	July	-	0.501	0.507	0.283	0.429
	August	0.203	0.405	0.254	0.161	0.181
	September	0.208	0.296	0.26	0.129	0.123
	October	0.129	0.191	0.0572	0.145	0.122
Embarrass River (STH 54)	May	-	0.0761	0.0914	0.0931	0.14
	June	-	0.122	0.0887	0.0527	0.108
	July	-	0.144	0.0897	0.067	0.15
	August	-	0.0918	0.101	0.0588	0.0767
	September	0.0633	0.0889	0.081	0.027	0.0698
	October	0.0298	0.0674	0.0263	0.0323	0.0324
Fox River	May	-	0.173	-	0.0778	0.228
	June	-	0.0895	0.169	0.0588	0.125
	July	-	0.209	0.0722	0.057	0.226
	August	-	0.106	-	0.0821	0.0679
	September	-	0.0706	-	0.091	0.06
	October	-	0.0469	0.0321	0.0725	-
Grand River	May	-	0.24	0.149	0.0767	0.0278
	June	-	0.208	0.184	0.147	0.0376
	July	-	0.174	0.237	0.235	0.0147
	August	0.178	0.148	0.16	0.296	0.0237
	September	0.11	0.0666	0.162	0.223	0.0237
	October	0.229	0.0705	0.0382	0.226	0.016
Little Wolf River	May	-	0.0515	0.0555	0.0447	0.111
	June	-	0.0566	0.0545	0.041	0.055
	July	-	0.0658	0.0476	0.032	0.146

	August	-	0.0457	0.0581	0.0391	0.0635
	September	0.0664	0.0323	0.038	0.021	0.151
	October	0.02	0.0384	0.0201	0.034	0.0209
Mecan River	May	-	0.0708	0.0482	0.0474	0.042
	June	-	0.0855	-	0.0266	0.0355
	July	-	0.0498	0.0454	0.0502	0.0608
	August	-	0.074	-	0.0323	0.0224
	September	-	0.0314	0.0323	0.0756	0.0197
	October	-	0.0326	0.0312	0.0218	0.0209
Montello River	May	-	0.122	0.0838	0.0476	0.0547
	June	-	0.104	-	0.0628	0.0723
	July	-	0.123	0.107	0.0539	0.0944
	August	-	0.0964	-	0.0413	0.0303
	September	-	0.0452	0.0492	0.0292	0.0278
	October	-	0.0611	0.0278	0.0298	0.0264
Mud Creek	May	-	0.694	0.291	0.0929	0.271
	June	-	-	0.348	0.375	0.386
	July	-	0.626	0.88	0.482	0.229
	August	-	0.597	0.751	0.774	0.235
	September	-	0.728	0.815	0.997	0.245
	October	-	0.51	0.812	0.718	0.176
Neenah Creek	May	-	0.131	-	0.111	0.116
	June	-	0.143	0.0914	0.064	0.134
	July	-	0.177	-	0.0967	0.362
	August	-	0.126	-	0.0911	0.122
	September	-	0.129	0.0852	0.0981	0.0737
	October	-	0.067	0.038	0.0581	0.0463
Pine River	May	-	-	0.0614	0.036	0.052
	June	-	0.0908	0.0373	0.0317	0.0507
	July	-	0.0438	0.0435	0.0378	0.0441
	August	-	0.0496	0.0466	0.0464	0.0344
	September	-	0.0364	0.0412	0.0376	0.0287
	October	-	0.173	0.028	0.034	0.032
Pipe Creek	May	-	-	0.183	0.0814	1.05
	June	-	0.205	0.299	0.415	0.123
	July	-	0.154	0.137	0.356	0.335
	August	-	0.31	0.226	0.241	0.065
	September	-	0.222	0.215	0.672	0.216
	October	-	0.561	0.306	0.221	0.356
Red River	May	-	-	0.0361	0.031	0.0568
	June	-	0.0408	0.0309	0.0366	0.0574
	July	-	0.0218	0.0192	0.018	0.0252

	August	0.0243	0.0241	0.0153	0.0211	0.0193
	September	0.0255	0.0144	0.0163	0.016	0.0246
	October	0.0142	0.0203	0.01	ND	0.0119
Shioc River	May	-	-	0.209	0.135	0.0658
	June	-	0.243	0.404	0.31	0.311
	July	-	0.194	0.393	0.449	0.512
	August	-	0.658	0.348	0.567	0.216
	September	0.275	0.338	0.264	0.331	0.215
	October	0.365	0.198	-	0.356	0.187
Waukau Creek	May	-	0.0917	0.129	0.0695	0.0455
	June	-	0.18	0.0984	0.14	0.084
	July	-	-	0.132	0.187	0.247
	August	0.143	0.124	0.168	0.123	0.0842
	September	0.0432	0.0772	0.285	0.0833	0.0731
	October	0.247	0.0424	0.0537	0.0796	0.0559
West Branch FDL River	May	-	0.338	0.462	0.128	0.279
	June	-	0.452	0.479	0.245	0.614
	July	-	0.856	0.462	0.533	0.559
	August	0.31	0.335	0.357	0.504	0.244
	September	0.177	0.204	0.252	1.23	0.348
	October	0.114	0.125	0.112	0.314	0.294
West Branch Wolf River	May	-	-	0.0252	0.0134	0.0216
	June	-	0.0435	0.0222	0.0302	-
	July	-	0.0238	0.0248	0.0195	0.0162
	August	-	0.0691	0.0151	0.0116	0.0165
	September	0.0188	0.00988	0.0155	0.0107	0.0111
	October	0.0178	0.0393	0.0111	0.043	0.0097
White River	May	-	0.044	0.0535	0.0457	0.0481
	June	-	0.0729	0.0556	0.031	0.0546
	July	-	0.0289	0.0376	0.0325	0.0224
	August	0.0238	0.0433	0.0177	0.0187	0.0198
	September	0.0211	0.0168	0.0252	ND	0.0348
	October	0.0326	0.0196	0.0144	0.0164	0.0123
Wolf River (CTH T)	May	-	0.041	0.0354	0.0701	0.0338
	June	-	0.0454	0.0258	0.0263	0.0421
	July	-	0.0343	0.0267	0.0306	0.0323
	August	0.036	0.0299	0.0351	0.0394	-
	September	0.036	0.0213	0.0265	0.0207	0.0249
	October	0.0249	0.0335	0.0216	0.0543	0.0278
Embarrass River (CTH M)	May	-	-	-	0.0342	0.0448
	June	-	-	-	0.0398	0.0483
	July	-	-	-	0.0307	0.0788

	August	-	-	-	0.0439	0.0519
	September	-	-	-	0.0332	0.0285
	October	-	-	-	0.0289	0.03
Pigeon River	May	-	-	-	0.0511	0.0791
	June	-	-	-	0.0673	0.08
	July	-	-	-	0.0668	0.0887
	August	-	-	-	0.078	0.0762
	September	-	-	-	0.0674	0.0502
	October	-	-	-	0.0514	0.0487
Sawyer Creek	May	-	-	-	0.0408	0.0914
	June	-	-	-	0.109	0.113
	July	-	-	-	0.203	0.149
	August	-	-	-	0.131	0.1
	September	-	-	-	0.0715	0.126
	October	-	-	-	0.0974	0.62
Waupaca River	May	-	-	-	0.0293	0.0743
	June	-	-	-	0.0253	0.0362
	July	-	-	-	0.0347	0.0546
	August	-	-	-	0.0324	0.0351
	September	-	-	-	0.0166	0.0415
	October	-	-	-	0.0237	0.0165

DRP (mg/L)						
Stream Name	Month	2020	2021	2022	2023	2024
Bear Creek	May	-	-	0.0438	0.0369	0.0563
	June	-	0.267	0.121	0.106	0.116
	July	-	0.116	0.183	0.135	0.196
	August	-	0.112	0.162	0.155	0.229
	September	0.033	0.0785	0.132	0.107	0.153
	October	0.071	0.0783	0.0422	0.229	0.14
Belle Fountain Creek	May	-	0.0279	0.0169	0.0174	0.0256
	June	-	0.0292	-	0.0154	0.0926
	July	-	0.0263	0.0176	0.0173	0.0345
	August	-	0.0512	-	0.0226	0.018
	September	-	0.036	0.0238	0.0248	0.0242
	October	-	0.0277	0.00975	0.0191	0.0208
East Branch FDL River	May	-	0.211	0.235	0.106	0.185
	June	-	0.183	0.256	0.158	0.235
	July	-	0.399	0.329	0.213	0.279
	August	0.179	0.331	0.205	0.107	0.123
	September	0.17	0.231	0.195	0.0688	0.0918
	October	0.116	0.161	0.036	0.0988	0.0969

Embarrass River (STH 54)	May	-	0.0345	0.0434	0.0485	0.0754
	June	-	0.0159	0.031	0.00903	0.0476
	July	-	0.0162	0.00853	0.0046	0.0945
	August	-	0.0567	0.0145	0.00658	0.0344
	September	0.0264	0.0301	0.0219	0.00665	0.0344
	October	0.0258	0.0344	0.0133	0.00511	0.0137
Fox River	May	-	0.0471	-	0.0273	0.0573
	June	-	0.0446	0.0567	0.0271	0.051
	July	-	0.101	0.0462	0.03	0.114
	August	-	0.0654	-	0.0508	0.0414
	September	-	0.0494	-	0.0606	0.0243
	October	-	0.0271	0.0174	0.0382	-
Grand River	May	-	0.147	0.0723	0.0234	0.0101
	June	-	0.16	0.154	0.113	0.0196
	July	-	0.144	0.179	0.199	0.00924
	August	0.174	0.138	0.11	0.231	0.00901
	September	0.0808	0.0503	0.137	0.19	0.0113
	October	0.0965	0.0579	0.0198	0.178	0.00873
Little Wolf River	May	-	0.0259	0.0204	0.0138	0.0478
	June	-	0.0332	0.021	0.0106	0.0246
	July	-	0.034	0.0193	0.0145	0.0404
	August	-	0.035	0.0273	0.0151	0.0178
	September	0.0335	0.0319	0.02	0.0095	0.0236
	October	0.0263	0.0236	0.0111	0.00915	0.00981
Mecan River	May	-	0.0158	0.00751	0.0069	0.00981
	June	-	0.0155	-	0.00572	0.00926
	July	-	0.0373	0.00547	0.00744	0.0153
	August	-	0.0291	-	0.00739	0.00704
	September	-	0.0186	0.0102	0.00653	0.00595
	October	-	0.00875	0.00854	0.00732	0.00691
Montello River	May	-	0.038	0.0285	0.0178	0.0299
	June	-	0.04	-	0.0321	0.0366
	July	-	0.0149	0.0394	0.0336	0.0462
	August	-	0.0593	-	0.0214	0.0167
	September	-	0.0236	0.0235	0.0163	0.0149
	October	-	0.0176	0.008	0.0143	0.0157
Mud Creek	May	-	0.606	0.236	0.054	0.232
	June	-	-	0.278	0.25	0.293
	July	-	0.573	0.774	0.383	0.162
	August	-	0.501	0.634	0.69	0.197
	September	-	0.704	0.766	0.918	0.199
	October	-	0.414	0.752	0.654	0.135

Neenah Creek	May	-	0.0264	-	0.00836	0.0103
	June	-	0.0266	0.0145	0.00907	0.0502
	July	-	0.0435	-	0.0091	0.107
	August	-	0.023	-	0.00866	0.0255
	September	-	0.00846	0.015	0.0146	0.0185
	October	-	0.00451	0.00578	0.00683	0.0158
Pine River	May	-	-	0.00838	0.0136	0.0247
	June	-	0.0146	0.013	0.0064	0.0236
	July	-	0.0129	0.0163	0.0218	0.0139
	August	-	0.014	0.0209	0.0198	0.014
	September	-	0.0145	0.0162	0.0171	0.0136
	October	-	0.0146	0.017	0.00819	0.0177
Pipe Creek	May	-	-	0.0369	0.044	0.471
	June	-	0.173	0.249	0.275	0.0629
	July	-	0.128	0.01	0.212	0.253
	August	-	0.272	0.161	0.0926	0.0263
	September	-	0.18	0.0976	0.122	0.145
	October	-	0.425	0.258	0.114	0.262
Red River	May	-	-	0.00832	ND	0.0137
	June	-	0.0134	0.0103	0.012	0.0171
	July	-	0.0178	0.00418	0.00543	0.00973
	August	0.0207	0.0157	0.0062	0.00677	0.00406
	September	0.0228	0.00386	0.00496	0.00634	0.008
	October	0.0256	0.00531	ND	ND	0.00666
Shioc River	May	-	-	0.121	0.0674	0.0304
	June	-	0.189	0.327	0.207	0.261
	July	-	0.114	0.306	0.394	0.405
	August	-	0.523	0.274	0.522	0.155
	September	0.147	0.278	0.148	0.267	0.18
	October	0.257	0.149	-	0.281	0.147
Waukau Creek	May	-	0.0433	0.0223	0.0281	0.0183
	June	-	0.14	0.0445	0.0945	0.0541
	July	-	-	0.0971	0.145	0.204
	August	0.0659	0.0832	0.116	0.0943	0.061
	September	0.032	0.0226	0.108	0.0583	0.0477
	October	0.167	0.0223	ND	0.0294	0.0309
West Branch FDL River	May	-	0.269	0.357	0.092	0.198
	June	-	0.383	0.379	0.199	0.489
	July	-	0.552	0.39	0.463	0.393
	August	0.249	0.277	0.312	0.451	0.189
	September	0.179	0.159	0.18	0.991	-
	October	0.11	0.107	0.0797	0.227	0.19

West Branch Wolf River	May	-	-	0.00761	0.00473	0.0072
	June	-	0.0101	0.00616	ND	-
	July	-	0.00931	0.00653	ND	ND
	August	-	0.00338	0.00654	0.00504	0.00638
	September	0.0251	0.00344	0.0056	0.00455	0.006
	October	0.0174	0.00754	0.00438	0.00483	0.00484
White River	May	-	0.013	0.0145	0.00622	0.00895
	June	-	0.0244	0.0109	0.00556	0.0161
	July	-	0.011	0.0135	0.00517	0.00856
	August	0.015	0.0151	0.00519	0.00518	0.00441
	September	0.0258	0.00552	0.00996	ND	0.00985
	October	0.0232	0.00739	0.00531	0.00639	0.00684
Wolf River (CTH T)	May	-	0.00579	0.0109	0.00603	0.00943
	June	-	0.0118	0.00794	ND	0.00714
	July	-	0.00879	0.00732	0.00703	0.0124
	August	0.0182	0.00368	0.00668	0.00591	-
	September	0.0254	0.00528	0.00759	0.0065	0.0072
	October	0.0184	0.0135	0.00519	0.00585	0.00912
Embarrass River (CTH M)	May	-	-	-	0.0102	0.02
	June	-	-	-	0.0087	0.0265
	July	-	-	-	0.00553	0.0442
	August	-	-	-	0.0119	0.0369
	September	-	-	-	0.00812	0.0124
	October	-	-	-	0.0101	0.0139
Pigeon River	May	-	-	-	0.0133	0.0248
	June	-	-	-	0.0204	0.033
	July	-	-	-	0.0206	0.0476
	August	-	-	-	0.0153	0.0344
	September	-	-	-	0.0126	0.0116
	October	-	-	-	0.0105	0.0111
Sawyer Creek	May	-	-	-	0.0146	0.0367
	June	-	-	-	0.0633	0.0728
	July	-	-	-	0.163	0.108
	August	-	-	-	0.0863	0.0632
	September	-	-	-	0.0353	0.0922
	October	-	-	-	0.0596	0.543
Waupaca River	May	-	-	-	0.00986	0.0278
	June	-	-	-	0.00843	0.0127
	July	-	-	-	0.0209	0.0239
	August	-	-	-	0.0154	0.0184
	September	-	-	-	0.00899	0.0211
	October	-	-	-	0.0052	0.00774

TSS (mg/L)						
Stream Name	Month	2020	2021	2022	2023	2024
Bear Creek	May	-	-	5.4	3.8	2
	June	-	7.4	4.75	10.3	14
	July	-	6.2	2.6	4.8	13.6
	August	-	4.6	2.6	2.8	5
	September	2.6	6	4.6	2.4	3
	October	ND	5.4	2.6	ND	3.8
Belle Fountain Creek	May	-	32	8.2	25	28.5
	June	-	42.6	-	19.4	7.5
	July	-	44.6	6	14.2	38
	August	-	14.6	-	22	7.6
	September	-	24.4	13.2	21	4.8
	October	-	27	3.8	2.8	4.4
East Branch FDL River	May	-	29.6	13.8	4.8	9.4
	June	-	56.6	60.8	25	35.2
	July	-	30	69	42.6	55.2
	August	5.6	16	14.8	18.8	6.6
	September	21	13.8	15.6	22.6	9.8
	October	4	8.8	3.8	12.6	4.4
Embarrass River (STH 54)	May	-	16	14	5.8	18.5
	June	-	44.8	23.2	15.2	32.8
	July	-	44.8	47.2	19	10.8
	August	-	17.4	28	22.8	18.8
	September	44	23.2	28.4	9.8	10.4
	October	2.8	28.6	2	5.25	7.8
Fox River	May	-	55.7	-	7	37
	June	-	19.2	44.5	4.6	15.8
	July	-	35.4	4.2	4.4	11.7
	August	-	9.14	-	5	4.4
	September	-	4.8	-	6	6
	October	-	3.2	2.8	4.2	-
Grand River	May	-	25.4	18.4	15.6	2.4
	June	-	23	3.6	ND	3.25
	July	-	2.4	15.4	10.6	ND
	August	ND	5.8	43.2	6.6	2.8
	September	2	ND	5	2.6	ND
	October	17.8	4.4	ND	3.4	3.2
Little Wolf River	May	-	10.3	9.8	9.4	18
	June	-	7.4	10.8	10.2	12.4
	July	-	8.2	9	4.6	61

	August	-	5.8	9.8	8.2	23.2
	September	24	5.2	6.4	4.8	36.3
	October	2	5.4	2.8	6.25	4.8
Mecan River	May	-	46.5	25	26	19.6
	June	-	33.4	-	11.6	18.6
	July	-	23.3	23.4	127	10.8
	August	-	7.4	-	27.8	6
	September	-	15.8	9.6	88.5	4.6
	October	-	9.2	9.6	7.8	8.4
Montello River	May	-	43.8	8.8	10.6	11.4
	June	-	33.6	-	7.4	13.4
	July	-	16.6	5.2	3	13.6
	August	-	12	-	2.4	ND
	September	-	24.2	20	4.2	ND
	October	-	22.2	11.8	4.6	ND
Mud Creek	May	-	9.6	13	3	4.6
	June	-	-	13.4	35.6	33.2
	July	-	18.4	38	46.8	22.3
	August	-	17.6	28.8	53	12.4
	September	-	7.4	22	24.6	4.8
	October	-	4.4	14	13.3	4.8
Neenah Creek	May	-	35.8	-	49.6	48
	June	-	60	24.8	21.2	8.8
	July	-	43.6	-	29.6	10.8
	August	-	20.4	-	26.4	29.1
	September	-	39.6	20.4	37	12
	October	-	23.6	10.8	15.2	8.2
Pine River	May	-	-	5	3.2	5
	June	-	17	6.75	6.4	7
	July	-	10.2	12	3.4	6.6
	August	-	12.4	8.2	6.5	4.6
	September	-	2.6	9.8	4.6	5
	October	-	3.6	2.4	7	2.8
Pipe Creek	May	-	-	8.6	2.8	356
	June	-	7	3.6	16.6	12.8
	July	-	3.2	23.4	13	16
	August	-	5.4	7.2	17.1	8.6
	September	-	17.6	19.3	330	9
	October	-	10.6	17	11	58.8
Red River	May	-	-	6.2	5	11.6
	June	-	11.2	4.4	9.8	8.25
	July	-	ND	ND	ND	2.2

	August	ND	2.2	ND	ND	ND
	September	4.4	ND	ND	ND	ND
	October	ND	ND	ND	ND	ND
Shioc River	May	-	-	3.4	10	ND
	June	-	2.8	12	2	2.4
	July	-	7.6	8.2	9.78	2
	August	-	4.6	3.4	2.2	2.75
	September	14.8	2	6.4	3.4	4.2
	October	5	2.6	-	ND	2.2
Waukau Creek	May	-	8.6	75.8	19.8	3.8
	June	-	5.8	46.8	4.2	8.8
	July	-	-	5.4	9.6	3.4
	August	7.4	8	6.6	4.8	9.6
	September	7.6	38.2	133	6.6	10.8
	October	117	7.2	10.8	9.4	16
West Branch FDL River	May	-	7	2.4	3.2	16.9
	June	-	6.2	10.8	3.4	8.6
	July	-	19.8	7.43	5.4	12.4
	August	12	5.8	3.2	2	2
	September	7	6.6	15.4	16.4	3.2
	October	5	2.4	2.2	3.2	10.4
West Branch Wolf River	May	-	-	5.6	ND	4.8
	June	-	5	4.6	3.4	-
	July	-	9.2	6.4	3.4	2.4
	August	-	17.2	2.6	ND	3.4
	September	ND	ND	2.2	2.2	ND
	October	8	26	ND	20.6	2.2
White River	May	-	22	21.6	24.2	18.2
	June	-	6	35.4	18	12
	July	-	7.6	17.4	4.2	3.25
	August	6.8	7.2	3.2	2	2.89
	September	4	3	5	ND	7.8
	October	ND	4.8	ND	2.8	2
Wolf River (CTH T)	May	-	7.2	6.2	6.4	8.29
	June	-	26.2	3.8	3.2	7
	July	-	4.4	ND	4.2	6
	August	4.4	3.2	6.4	8.4	-
	September	4.6	3	4	2.4	2
	October	2.6	3.6	47.6	ND	5.8
Embarrass River (CTH M)	May	-	-	-	6.2	9.6
	June	-	-	-	6.8	5.6
	July	-	-	-	6	10.6

	August	-	-	-	8.67	8.2
	September	-	-	-	7.8	4.6
	October	-	-	-	5	5
Pigeon River	May	-	-	-	8	10.2
	June	-	-	-	10.2	10.2
	July	-	-	-	8.2	8.6
	August	-	-	-	7.6	9
	September	-	-	-	11.2	10.6
	October	-	-	-	8	9.6
Sawyer Creek	May	-	-	-	4.8	4.4
	June	-	-	-	8.8	7.8
	July	-	-	-	3.2	5
	August	-	-	-	4.4	4.8
	September	-	-	-	5	4.2
	October	-	-	-	4.6	15
Waupaca River	May	-	-	-	2.8	7.2
	June	-	-	-	2.6	5.2
	July	-	-	-	2	6.2
	August	-	-	-	ND	ND
	September	-	-	-	ND	4.4
	October	-	-	-	2.2	ND

TN (mg/L)						
Stream Name	Month	2020	2021	2022	2023	2024
Bear Creek	May	-	-	1.49	1.85	1.75
	June	-	1.29	1.66	0.999	2.63
	July	-	2.1	1.21	0.883	2
	August	-	2.59	0.888	0.527	1.75
	September	0.99	2.34	1.48	0.505	1.76
	October	0.763	1.76	1.74	0.521	1.51
Belle Fountain Creek	May	-	4.05	3.7	4.52	3.41
	June	-	3.81	-	4.59	1.95
	July	-	4.35	4.13	4.5	3.81
	August	-	3.11	-	3.58	3.78
	September	-	4.09	3.67	4.59	3.55
	October	-	4.31	3.66	3.73	4.18
East Branch FDL River	May	-	2.91	2.53	3.22	3.76
	June	-	5.46	2.97	3.92	3.52
	July	-	2.71	5.71	3.4	2.77
	August	3.51	2.48	3.27	2.57	4.28
	September	2.26	2.64	2.81	1.86	5.5
	October	3.12	3.14	3.78	2.99	6.56

Embarrass River (STH 54)	May	-	2.03	1.58	1.37	1.8
	June	-	1.85	1.78	2.1	2.31
	July	-	1.83	1.97	1.82	1.8
	August	-	1.34	2.02	1.89	2.38
	September	2.88	2.47	1.76	2.14	2.11
	October	2.4	2.05	2.41	2.36	3.07
Fox River	May	-	4.56	-	5.23	3.44
	June	-	5.51	4.25	5.23	4.12
	July	-	2.21	5.08	4.94	1.8
	August	-	4.87	-	4.82	4.69
	September	-	4.43	-	4.42	4.77
	October	-	4.91	4.91	4.6	-
Grand River	May	-	3.61	2.77	4	2.06
	June	-	1.64	2.72	2.35	1.53
	July	-	1.86	2.12	1.08	2.14
	August	2.07	2.57	1.97	1.11	2.3
	September	3.32	2.73	3.04	1.23	1.56
	October	3.94	3.94	3.24	2.1	3.3
Little Wolf River	May	-	2.11	1.62	2	1.6
	June	-	2.01	2.08	2.31	2.31
	July	-	1.98	1.86	1.74	2.2
	August	-	1.84	2.05	1.85	1.73
	September	2.31	2.34	1.86	2.05	2.04
	October	2.55	2.14	2.56	2.2	2.8
Mecan River	May	-	2.34	2.22	2.08	2.31
	June	-	1.9	-	2.29	2.38
	July	-	2.25	2.25	2.37	1.88
	August	-	1.28	-	2.09	2.38
	September	-	2.56	2.31	2.62	2.47
	October	-	2.42	2.38	2.84	2.81
Montello River	May	-	1.8	1.4	1.66	1.44
	June	-	1.73	-	2.18	1.71
	July	-	1.16	1.17	0.874	1.46
	August	-	1.23	-	0.682	1.17
	September	-	1.08	1.01	0.766	1.25
	October	-	1.43	1.87	1.56	1.63
Mud Creek	May	-	3.27	2.56	2.83	4.17
	June	-	-	16.2	17.4	5.33
	July	-	3.62	5.56	5.32	5.97
	August	-	2.35	3.82	2.93	4.36
	September	-	5.01	4.72	5.41	2.17
	October	-	4.02	7.18	0.972	6.3

Neenah Creek	May	-	1.78	-	1.5	1.88
	June	-	1.64	2.07	1.28	1.89
	July	-	1.95	-	1.09	1.31
	August	-	1.25	-	0.949	1.13
	September	-	1.54	1.27	1.26	0.944
	October	-	1.73	1.32	1.36	1.34
Pine River	May	-	-	2.22	2.22	2.06
	June	-	2.09	2.18	2.27	2.37
	July	-	2.28	2.2	1.89	2.47
	August	-	1.97	1.89	1.77	2.73
	September	-	2.3	2.09	2.03	2.32
	October	-	2.39	2.28	2.33	2.32
Pipe Creek	May	-	-	1.84	8.96	12
	June	-	1.22	12	38.2	3.72
	July	-	8.14	7.03	1.72	8.83
	August	-	4.74	2.1	1.1	2.39
	September	-	2.28	1.59	2.66	1.49
	October	-	4.92	1.87	1.07	1.25
Red River	May	-	-	1.26	1.48	1.22
	June	-	1.22	1.31	1.03	2.16
	July	-	1.23	1.06	0.973	0.437
	August	1.38	2.28	1.15	1.11	1.45
	September	1.5	1.23	1.34	1.33	1.41
	October	2.2	1.62	1.57	1.54	1.85
Shioc River	May	-	-	1.79	1.74	2.59
	June	-	1.62	1.71	1.22	2.03
	July	-	2.75	1.13	1.04	1.61
	August	-	1.8	1.86	1.05	1.64
	September	1.74	1.41	2.74	0.736	1.93
	October	1.34	1.59	-	0.773	1.56
Waukau Creek	May	-	1.31	1.37	1.52	1.5
	June	-	0.916	2.48	1.17	2.28
	July	-	-	1.26	0.88	1.94
	August	0.964	1.41	1.54	0.606	1.37
	September	1.03	1.24	4.6	0.397	1.11
	October	1.84	1.36	1.21	0.47	1.07
West Branch FDL River	May	-	1.18	1.21	0.792	1.4
	June	-	2.01	1.32	1.03	1.53
	July	-	1.46	1.2	1.12	1.22
	August	1.23	1.14	1.09	0.986	1.11
	September	0.938	1.03	1.16	1.57	1.03
	October	0.911	0.799	0.777	1.39	2.2

West Branch Wolf River	May	-	-	0.718	0.708	0.697
	June	-	0.777	0.772	0.931	-
	July	-	0.652	0.681	0.544	1.45
	August	-	0.926	0.546	0.577	0.61
	September	0.623	0.588	0.561	0.643	0.583
	October	0.892	0.997	0.847	1.08	0.813
White River	May	-	1.88	1.57	1.95	1.51
	June	-	1.4	1.87	1.55	1.31
	July	-	1.6	1.46	1.32	1.61
	August	1.38	1.43	1.55	1.48	1.43
	September	1.95	1.97	1.73	1.91	1.55
	October	1.5	2.43	2.09	2.38	2.12
Wolf River (CTH T)	May	-	0.657	0.656	0.912	0.79
	June	-	0.658	0.577	0.64	0.91
	July	-	0.601	0.602	0.64	0.725
	August	0.755	0.566	0.652	0.639	-
	September	0.711	0.556	0.552	0.641	0.809
	October	0.642	0.858	0.51	0.793	0.826
Embarrass River (CTH M)	May	-	-	-	2.07	1.58
	June	-	-	-	2.49	2.61
	July	-	-	-	2	1.86
	August	-	-	-	2.44	2.43
	September	-	-	-	2.7	2.68
	October	-	-	-	2.89	2.93
Pigeon River	May	-	-	-	1.7	1.74
	June	-	-	-	2.19	2.11
	July	-	-	-	1.8	1.85
	August	-	-	-	1.46	1.91
	September	-	-	-	1.72	2.14
	October	-	-	-	1.76	2.01
Sawyer Creek	May	-	-	-	3.48	2.15
	June	-	-	-	5.6	4.35
	July	-	-	-	0.832	3.71
	August	-	-	-	1.08	0.821
	September	-	-	-	0.866	0.821
	October	-	-	-	0.665	1.39
Waupaca River	May	-	-	-	3.13	2.13
	June	-	-	-	2.78	2.91
	July	-	-	-	2.52	2.45
	August	-	-	-	2.45	2.75
	September	-	-	-	3.15	2.76
	October	-	-	-	3.91	3.69

ND indicates sample concentration was not detected.

Appendix K: Duplicate Sample Data

Monitoring Location	Date	Parameter	Duplicate Sample	Regular Sample	Absolute Difference		Relative Percent Difference
Montello River at 11th St.	9/22/2022	PHOSPHATE ORTHO DISS	0.0241	0.0235	0.0006	MG/L	2.52
	9/22/2022	RESIDUE TOTAL NFLT (TOTAL SUSPENDED SOLIDS)	6.8	20	-13.2	MG/L	-98.51
	9/22/2022	PHOSPHORUS TOTAL	0.0589	0.0492	0.0097	MG/L	17.95
	9/22/2022	NITROGEN TOTAL	1.08	1.01	0.07	MG/L	6.70
West Branch Fond Du Lac River Immediately below 12th St.	9/20/2022	PHOSPHATE ORTHO DISS	0.182	0.18	0.002	MG/L	1.10
	9/20/2022	RESIDUE TOTAL NFLT (TOTAL SUSPENDED SOLIDS)	19.4	15.4	4	MG/L	22.99
	9/20/2022	PHOSPHORUS TOTAL	0.254	0.252	0.002	MG/L	0.79
	9/20/2022	NITROGEN TOTAL	1.16	1.16	0	MG/L	0.00
White River - White River Rd Landing	8/24/2022	PHOSPHATE ORTHO DISS	0.00513	0.00519	-0.00006	MG/L	-1.16
	8/24/2022	RESIDUE TOTAL NFLT (TOTAL SUSPENDED SOLIDS)	3	3.2	-0.2	MG/L	-6.45
	8/24/2022	PHOSPHORUS TOTAL	0.0177	0.0177	0	MG/L	0.00
	8/24/2022	NITROGEN TOTAL	1.55	1.55	0	MG/L	0.00
Little Wolf River - HWY 54	8/17/2022	PHOSPHATE ORTHO DISS	0.0267	0.0273	-0.0006	MG/L	-2.22
	8/17/2022	RESIDUE TOTAL NFLT (TOTAL SUSPENDED SOLIDS)	10.4	9.8	0.6	MG/L	5.94
	8/17/2022	PHOSPHORUS TOTAL	0.0584	0.0581	0.0003	MG/L	0.52
	8/17/2022	NITROGEN TOTAL	2.06	2.05	0.01	MG/L	0.49
Wolf River at CTH T	8/16/2022	PHOSPHATE ORTHO DISS	0.00705	0.00668	0.00037	MG/L	5.39
	8/16/2022	RESIDUE TOTAL NFLT (TOTAL SUSPENDED SOLIDS)	7.6	6.4	1.2	MG/L	17.14
	8/16/2022	PHOSPHORUS TOTAL	0.0449	0.0351	0.0098	MG/L	24.50
	8/16/2022	NITROGEN TOTAL	0.753	0.652	0.101	MG/L	14.38
Mud Creek - Mud Creek Rd	7/26/2022	PHOSPHATE ORTHO DISS	0.466	0.774	-0.308	MG/L	-49.68
	7/26/2022	RESIDUE TOTAL NFLT (TOTAL SUSPENDED SOLIDS)	34.2	38	-3.8	MG/L	-10.53
	7/26/2022	PHOSPHORUS TOTAL	0.529	0.88	-0.351	MG/L	-49.82
	7/26/2022	NITROGEN TOTAL	1.9	5.56	-3.66	MG/L	-98.12

Bear Creek- STH 76	6/13/2022	PHOSPHATE ORTHO DISS	0.12	0.121	-0.001	MG/L	-0.83
	6/13/2022	RESIDUE TOTAL NFLT (TOTAL SUSPENDED SOLIDS)	4.4	4.75	-0.35	MG/L	-7.65
	6/13/2022	PHOSPHORUS TOTAL	0.161	0.167	-0.006	MG/L	-3.66
	6/13/2022	NITROGEN TOTAL	1.64	1.66	-0.02	MG/L	-1.21
Pipe Creek - 30 ft Above HWY 151 Bridge	6/14/2023	PHOSPHATE ORTHO DISS	0.277	0.275	0.002	MG/L	0.72
	6/14/2023	RESIDUE TOTAL NFLT (TOTAL SUSPENDED SOLIDS)	16.8	16.6	0.2	MG/L	1.20
	6/14/2023	PHOSPHORUS TOTAL	0.417	0.415	0.002	MG/L	0.48
	6/14/2023	NITROGEN TOTAL	38.3	38.2	0.1	MG/L	0.26
West Branch FDL on Forest Ave	8/21/2023	PHOSPHATE ORTHO DISS	0.453	0.451	0.002	MG/L	0.44
	8/21/2023	RESIDUE TOTAL NFLT (TOTAL SUSPENDED SOLIDS)	2.2	2	0.2	MG/L	9.52
	8/21/2023	PHOSPHORUS TOTAL	0.504	0.504	0	MG/L	0.00
	8/21/2023	NITROGEN TOTAL	0.98	0.986	-0.006	MG/L	-0.61
Mecan River - CTH C East of Montello	8/13/2024	PHOSPHATE ORTHO DISS	0.00664	0.00704	-0.0004	MG/L	-5.85
	8/13/2024	RESIDUE TOTAL NFLT (TOTAL SUSPENDED SOLIDS)	5.8	6	-0.2	MG/L	-3.39
	8/13/2024	PHOSPHORUS TOTAL	0.0231	0.0224	0.0007	MG/L	3.08
	8/13/2024	NITROGEN TOTAL	2.36	2.38	-0.02	MG/L	-0.84

Highlighted cells indicate variance (relative percent difference >30%) between regular and duplicate sample results.

Mud Creek at Mud Creek Road duplicate (7/26/2022) was taken on a different day than original sample, disregard as duplicate sample.

Appendix L: Stream Flow and Transparency Data

		Stream Flow (CFS)					Transparency (CM)				
Stream Name	Month	2020	2021	2022	2023	2024	2020	2021	2022	2023	2024
Bear Creek	May	-	-	-	-	-	-	-	120	120	120
	June	-	4.67	-	-	-	-	82.9	-	75	45
	July	-	40.7	-	-	-	-	93.7	-	120	65
	August	-	-	-	-	-	-	91	120	120	115
	September	-	64.2	-	-	-	-	72	100	120	90
	October	6.5	-	-	-	-	106	99	-	120	80
Belle Fountain Creek	May	-	-	-	-	-	-	55	120	75	-
	June	-	-	-	-	-	-	56	-	60	-
	July	-	-	-	-	-	-	62	-	45	-
	August	-	-	-	-	-	-	77	-	120	-
	September	-	-	-	-	-	-	74	-	40	-
	October	-	-	-	-	-	-	120	-	95	-
East Branch FDL River	May	-	10.76	38.12	22.2	17.725	-	-	39.7	71.85	32.6
	June	-	-	93.1	17.85	49.2	-	12.2	10.7	22.6	15.4
	July	-	11.28	-	14	-	-	17.9	12.8	17	16.4
	August	0.6	-	15.9	11.8	26.7	60	28.2	27.4	27.9	45.5
	September	420	10.8	-	12.1	10.2	34	25.66	27.3	26.2	38.2
	October	19.06	0.65	11.2	7.3	9.8	80.6	50.3	79	26.6	53.8
Embarrass River (STH 54)	May	-	-	-	-	-	-	43	40.5	116	42
	June	-	-	-	-	-	-	18	31.2	59.2	-
	July	-	-	-	-	-	-	34.2	43.2	42	86
	August	-	-	-	-	-	-	45.5	42.5	36.2	73
	September	-	-	-	-	-	62.5	48	125	69.5	88
	October	-	-	-	-	-	-	81	66.2	112	117
Fox River	May	-	-	-	-	-	-	56	-	90	-
	June	-	-	-	-	-	-	72.5	-	120	85
	July	-	-	-	-	-	-	53.5	49.5	120	78

	August	-	-	-	-	-	-	90	-	120	120
	September	-	-	-	-	-	-	120	-	120	120
	October	-	-	-	-	-	-	100	120	120	-
Grand River	May	-	-	-	-	-	-	76.5	-	120	-
	June	-	-	-	-	-	-	120	120	105	-
	July	-	-	-	-	-	-	120	-	95	-
	August	-	-	-	-	-	120	102	-	120	-
	September	-	-	-	-	-	120	120	120	100	-
	October	-	-	-	-	-	120	120	120	95	-
Little Wolf River	May	-	-	-	-	-	-	94.2	95.6	120	49
	June	-	-	-	-	-	-	111.5	65	120	-
	July	-	-	-	-	-	-	96.4	100.1	120	35
	August	-	-	-	-	-	-	-	98.5	120	65
	September	-	-	-	-	-	74	120	107	120	75
	October	-	-	-	-	-	-	120	125	120	120
Mecan River	May	-	-	-	-	-	-	52	81	88	-
	June	-	-	-	-	-	-	74	-	103	76
	July	-	-	-	-	-	-	66	72	65	87
	August	-	-	-	-	-	-	93	-	120	120
	September	-	-	-	-	-	-	94	-	110	120
	October	-	-	-	-	-	-	118	-	120	105
Montello River	May	-	-	-	-	-	-	84	120	120	90
	June	-	-	-	-	-	-	77	-	120	118
	July	-	-	-	-	-	-	-	52	120	-
	August	-	-	-	-	-	-	98	-	120	120
	September	-	-	-	-	-	-	90	-	120	120
	October	-	-	-	-	-	-	97	-	120	120
Mud Creek	May	-	1.18	1.3	8.18	-	-	-	23.6	79.3	70
	June	-	-	15.1	-	1.52	-	-	30.5	22	26
	July	-	0	1.4	-	-	-	31	13.46	-	17.8

	August	-	-	0.6	0	-	-	29.65	9.96	17	33.5
	September	-	-	0.053	0	-	-	32.5	19.16	26.8	40
	October	-	-	-	0	-	-	111.45	22.5	39	67.5
Neenah Creek	May	-	-	-	-	-	-	56	-	33	27
	June	-	-	-	-	-	-	35	-	46	41
	July	-	-	-	-	-	-	27.5	-	36	41
	August	-	-	-	-	-	-	51	-	35	35
	September	-	-	-	-	-	-	28	120	40	45
	October	-	-	-	-	-	-	55	60	57	46
Pine River	May	-	-	-	-	-	-	-	88	120	95.5
	June	-	-	-	-	-	-	-	76.8	100	100
	July	-	-	-	-	-	-	66	50	120	85
	August	-	-	-	-	-	-	75	58	85	80
	September	-	-	-	-	-	-	120	90	80	80
	October	-	-	-	-	-	-	120	120	75	120
Pipe Creek	May	-	-	-	-	-	-	0	-	-	-
	June	-	-	-	-	-	-	8.58	-	-	44
	July	-	-	-	-	-	-	-	-	-	120
	August	-	-	-	-	-	-	-	-	-	72.25
	September	-	-	-	-	-	-	-	-	-	120
	October	-	-	-	-	-	-	-	-	-	120
Red River	May	-	-	-	-	-	-	-	99	-	99.2
	June	-	-	-	-	-	-	-	120	120	-
	July	-	-	-	-	-	-	-	120	120	-
	August	209.76	-	-	-	-	120	120	120	-	120
	September	-	-	-	-	-	120	120	120	-	120
	October	93	-	-	-	-	120	120	120	-	120
Shioc River	May	-	-	-	-	-	-	-	-	120	120
	June	-	-	-	-	-	-	-	-	-	120
	July	-	-	-	-	-	-	95	-	-	120

	August	-	-	-	-	-	-	54	-	120	-
	September	-	-	-	-	-	-	120	-	120	118
	October	-	-	-	-	-	51	120	-	108	114
Waukau Creek	May	-	44.3	-	-	-	-	115	20	25	-
	June	-	21.1	-	-	-	-	89.4	-	44	20
	July	-	-	-	-	-	-	-	-	49	35
	August	-	-	-	-	-	60.8	95.4	27	62	35
	September	-	-	-	-	-	75.4	53.4	-	32	-
	October	-	-	-	-	-	39.2	60.8	57.2	48	25
West Branch FDL River	May	-	-	-	-	-	-	54.2	120	120	44.8
	June	-	-	-	-	-	-	52.45	52.1	37.5	43.3
	July	-	-	-	-	-	-	51.88	46.3	77.3	36.8
	August	-	-	-	-	-	76	79.26	72.4	120	84.9
	September	-	-	-	-	-	95	83.93	43	25.6	74.5
	October	-	-	-	-	-	105.3	120	90.4	97	52
West Branch Wolf River	May	-	-	-	-	-	-	-	120	120	120
	June	-	-	-	-	-	-	115	120	120	-
	July	-	-	-	-	-	-	110	120	-	-
	August	-	-	-	-	-	-	92.5	120	-	120
	September	-	-	-	-	-	120	120	120	120	120
	October	-	-	-	-	-	67.4	120	120	-	120
White River	May	-	-	-	102.9	-	-	56	70	60	-
	June	-	-	-	61.4	-	-	108	-	-	-
	July	-	-	-	-	-	-	120	-	-	-
	August	-	-	-	56.97	-	120	72	-	-	-
	September	-	-	-	-	-	120	120	102.5	-	-
	October	-	-	-	61.78	-	120	120	120	-	-
Wolf River (CTH T)	May	-	-	-	-	-	-	-	-	-	-
	June	-	-	-	-	-	-	-	-	-	-
	July	-	-	-	-	-	-	-	-	-	-

	August	-	-	-	-	-	109	-	-	-	-
	September	-	-	-	-	-	-	-	-	120	-
	October	-	-	-	-	-	95	-	-	-	-
Embarrass River (CTH M)	May	-	-	-	-	-	-	-	-	115	100
	June	-	-	-	-	-	-	-	-	110	120
	July	-	-	-	-	-	-	-	-	120	85
	August	-	-	-	-	-	-	-	-	100	100
	September	-	-	-	-	-	-	-	-	-	120
	October	-	-	-	-	-	-	-	-	-	100
Pigeon River	May	-	-	-	-	-	-	-	-	-	62
	June	-	-	-	-	-	-	-	-	89	77
	July	-	-	-	-	-	-	-	-	110.4	66
	August	-	-	-	-	-	-	-	-	100	83.5
	September	-	-	-	-	-	-	-	-	81.5	76
	October	-	-	-	-	-	-	-	-	90	76.4
Sawyer Creek	May	-	-	-	-	-	-	-	-	115	84
	June	-	-	-	-	-	-	-	-	56.4	71.5
	July	-	-	-	-	-	-	-	-	120	78.4
	August	-	-	-	-	-	-	-	-	98	75.2
	September	-	-	-	-	-	-	-	-	118	120
	October	-	-	-	-	-	-	-	-	113.2	12.2
Waupaca River	May	-	-	-	-	-	-	-	-	120	89
	June	-	-	-	-	-	-	-	-	120	-
	July	-	-	-	-	-	-	-	-	120	112
	August	-	-	-	-	-	-	-	-	120	120
	September	-	-	-	-	-	-	-	-	120	120
	October	-	-	-	-	-	-	-	-	120	120

Appendix M: 2024 WI DNR Press Release

DNR SEEKING VOLUNTEERS FOR STREAM MONITORING IN CENTRAL AND NORTHEASTERN WISCONSIN

Volunteers are needed to help sample streams and rivers in the Lower Fox, Upper Fox and Wolf River and Northeast Lakeshore basins.
Photo credit: Wisconsin DNR

MADISON, Wis. – The Wisconsin Department of Natural Resources (DNR) is seeking volunteers to help monitor streams and rivers in several river basins located in central and northeastern Wisconsin, specifically the Lower Fox, Upper Fox and Wolf River and Northeast Lakeshore basins. Sampling is essential for monitoring water quality improvements, assessing implementation activities and evaluating long-term land use changes.

There are multiple monitoring locations in each basin that need volunteers, and more than one volunteer can sample each site. Sampling occurs once a month from May through October, which is the prime algae growing season, making it easier to determine which streams are affected by

elevated nutrient and suspended sediment concentrations.

Monitoring locations are located at or near road crossings and are chosen for their ease of access. Volunteers should be comfortable wading into the water, but no previous water quality experience is needed. Volunteers will be trained on DNR protocol, and all equipment will be supplied except for boots/waders.

When sampling, each volunteer will need to fill three bottles with water from the stream and take up to two field measurements; the entire process takes about one hour each month. The samples then need to be packed on ice in the provided cooler and dropped off at the closest U.S. post office to be shipped to the State Laboratory of Hygiene in Madison for analysis.

The Lower Fox, Upper Fox and Wolf River and Northeast Lakeshore basins have total maximum daily loads, which identify a need for pollutant reductions to meet water quality standards and provide a framework to meet those standards. The volunteer programs help to fulfill monitoring goals.

Volunteers are crucial for these monitoring programs. The DNR would not be able to monitor as many waterbodies without volunteers' help. Water resources are important for many reasons, including recreation, habitat and health. This program is a great way for volunteers to learn about the water quality in their area and how they can become involved.

For more information about volunteering at these sites, contact Katherine Wendorf at Katherine.Wendorf@wisconsin.gov or 920-296-5126 or visit the DNR website:

- Lower Fox River Basin
- Upper Fox and Wolf River Basins
- Northeast Lakeshore Basin